SCIENTIFIC AMERICAN

[Entered at the Post Office of New York. N. Y.. as Second Class Matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY AND MANUFACTURES.

Vol. XLV.—No. 11. [NEW SERIES.] NEW YORK, SEPTEMBER 10, 1881. $3.20 per Annum. [POSTAGE PREPAID.]

THE PARIS ELECTRICAL EXHIBITION.

Since our notice of the opening (on August 11) of the International Exhibition at Paris, most of the delinquent exhibits have been put in place, and the success of the undertaking has been assured. Upward of 1,800 exhibitors have contributed to this pioneer display of the applications of electricity to scientific, industrial, and domestic affairs; and it is noticed as a significant indication of the rapidity of modern progress that the exhibition of a single scientific industry, and that a comparatively new one, should require more space than sufficed for an entire international exhibition of the arts and sciences a quarter of a century ago. The Palais de l'Industrie, with its 45,000 square meters of space, was ample for the World's Fair of 1855. It is now crowded with electrical exhibits, and many pavilions of wood and iron have been erected around it for the additional space required.

The form of the great hall of the palace is rectangular, the open central space being about 250 meters long and 100 meters broad. The walls are of masonry. The arched roof is carried by lofty iron pillars, about 8 meters apart, with galleries on every side, under which are receding spaces, about 30 meters deep. In one of these under spaces are the boilers, engines, and dynamo machines. The French syndicate which supplies the power serves 200 magneto-electric machines of various systems, including those of Gramme, Siemens, Weston, Edison, etc. Several of these machines are illustrated in the accompanying engravings.

Fig. 1 shows the new Gramme machine, which is substantially the same as the older machines, descriptions of which have already appeared in this paper. The later machines have, however, a new expansive boss or hub for holding the ring, and are provided with improved journals and lubricators.

Fig. 2 shows a new form of Gramme machine especially adapted to sending currents through long conductors or great resistances. In the machine the magnets are placed in a cast iron octagonal frame, which protects them and other parts from injury, and renders the machine very compact, facilitates shipping, placing, etc. This machine has four magnets and four collectors for taking off the current. It weighs 1,030 pounds, and will send a current 2½ miles. The Gramme Company make another machine of the same class that will transmit 12 to 16 horse power 5 miles. It is found by experience that proportionately greater effects are realized when two machines are coupled on the same shaft.

These machines are especially adapted to the Gramme lamp, the inventor of which does not believe in extensive subdivision of the current, but prefers a small number of arc lights. He has succeeded well.

[*Continued on page* 162.]

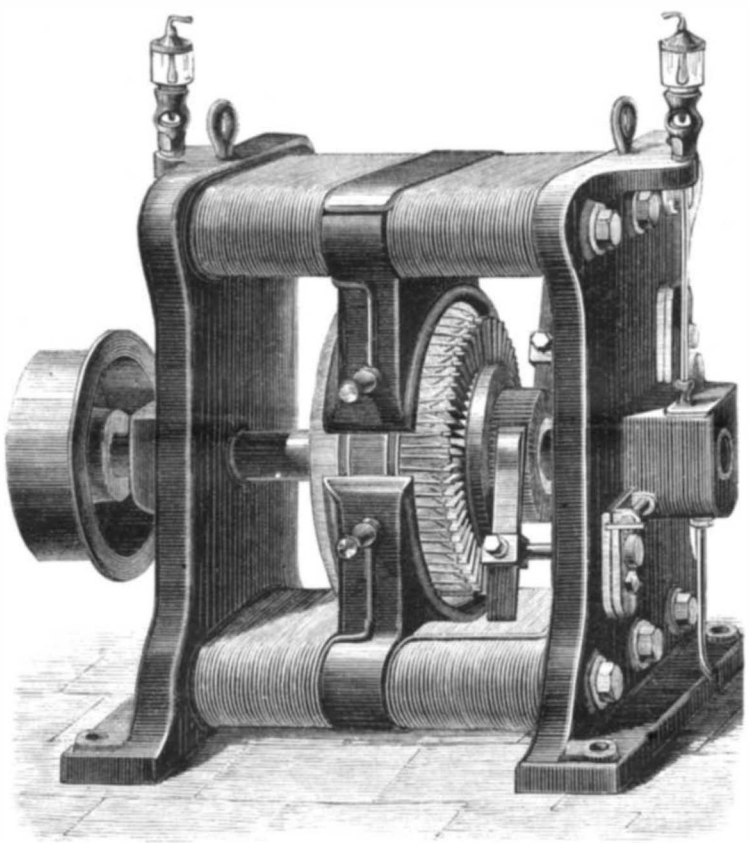

Fig. 1.—IMPROVED GRAMME DYNAMO-ELECTRIC MACHINE.

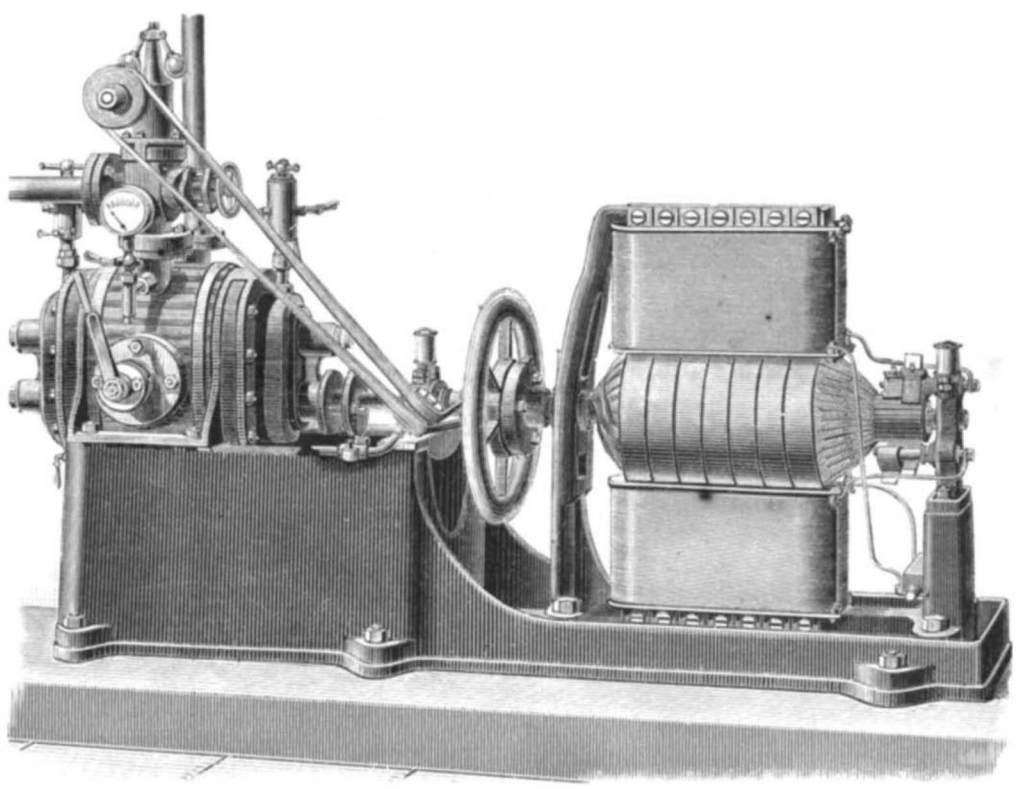

Fig. 4.—SIEMENS STEAM DYNAMO-ELECTRIC MACHINE FOR ELECTRIC RAILWAY.

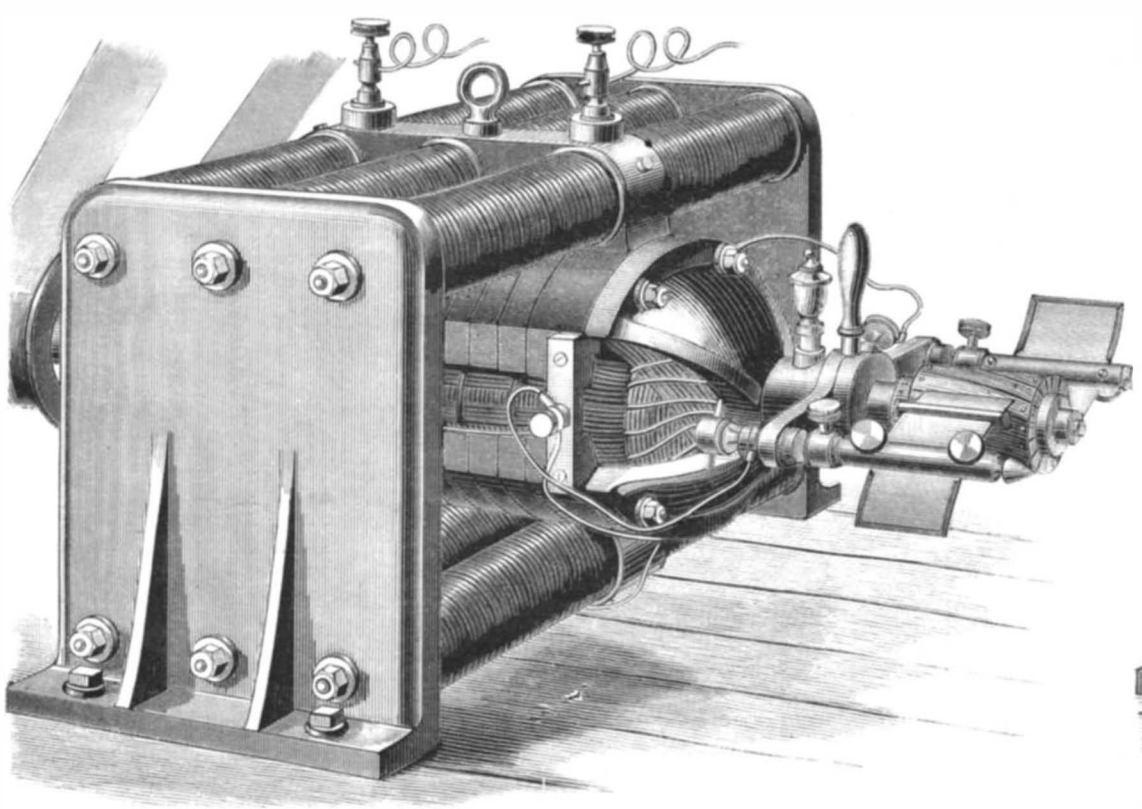

Fig. 3.—WESTON DYNAMO-ELECTRIC MACHINE—IMPROVED FORM.

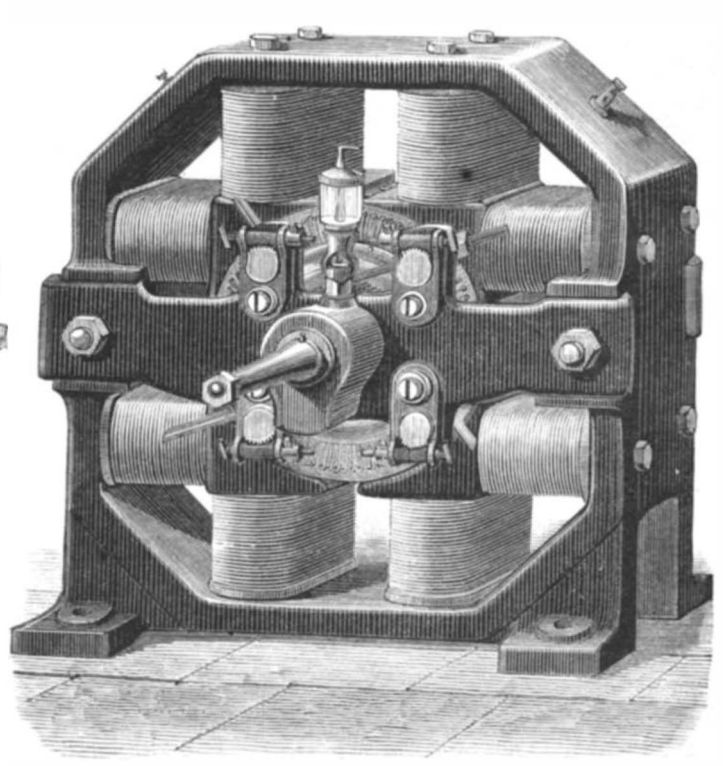

Fig. 2.—GRAMME MACHINE GENERATING CURRENTS FOR LONG DISTANCES.

THE INTERNATIONAL ELECTRICAL EXHIBITION OF 1881 AT PARIS.

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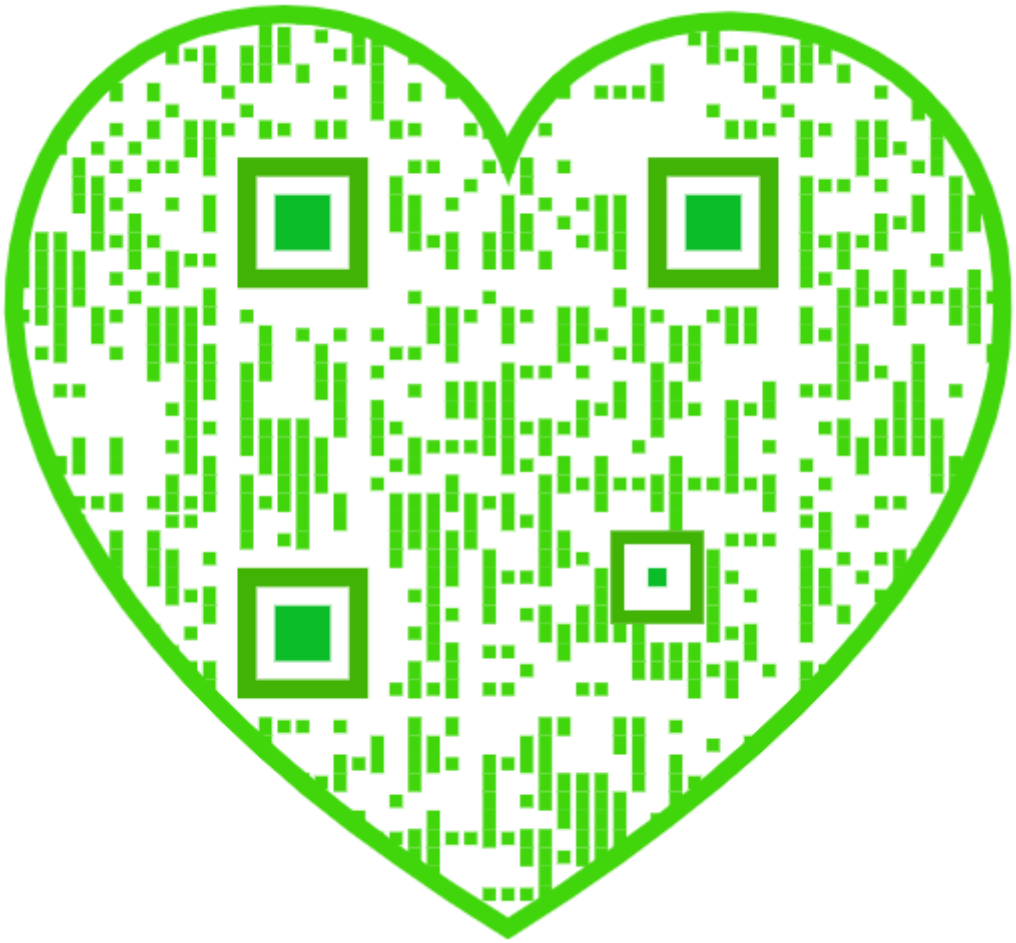

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

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NEW YORK, SATURDAY, SEPTEMBER 10, 1881.

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BOOT AND SHOE SEWING-MACHINE PATENTS.

The expiration, August 14, of two of what have heretofore been considered the "controlling" patents of the McKay Sewing Machine Association, is a matter in which the general public, and every one connected with the boot and shoe manufacture, is interested. These machines, first patented in 1858, and generally introduced in the shoe manufacture from 1860 to 1862, worked a revolution in the business of making boots and shoes. To them, more than to any other one cause, do we owe the fact that a custom shoemaker is now but rarely employed by the general public, except for cobbling and repairing, and the great bulk of all the boots and shoes worn are produced in factories. The original patents were obtained by Lyman R. Blake, but they subsequently came into possession of Gordon McKay, the organizer of the McKay Association, and Mr. McKay has, since 1859, devoted abilities and energy of no ordinary character to the improvement of these and other machines used in the shoe manufacture, for which he has obtained many patents.

The patent on the original sole-sewing machine expired July 6, 1879, and that on the revolving horn and some other features August 12, 1879. Previous to that time it had been the opinion of many manufacturers that they would then be free to make boots and shoes with the machine without further payment to the patentee, but two other patents had been obtained, within two years of the introduction of the invention, which, with the extensions, practically extended the life of the machine patent to August 14 last. These were: One on the shoe made by the machine as a new product, and one on the process of making. The shoe made differed from preceding hand-made styles in that it was without a welt, the stitches being taken directly through the insole, the inserted edge of the upper, and the outsole, a mode not altogether new, but which, without the machine, was not a practical success. The validity of these two patents was contested in the courts, and it was argued that the patent on the machine itself necessarily covered the process of making and the kind of shoe made, but Judge Blatchford, in the United States Court for the Southern District of New York, sustained the patents. These were the ones which have just run out, but, in addition thereto, nearly all the sewing machines now in use contain other patented improvements owned by the McKay Association. One of these, for which the patent expires December 13, 1881, is the "variable stroke," by which the machine is made to automatically adapt itself to the work for soles differing in thickness, so that the needle will take up a loop just sufficient to draw the thread tight, without "rendering" or slipping in the eye. This is a point which is very essential to firmly fasten the sole and retain the full strength of the thread. Another patent, for what is known as the "high speed" improvement, does not expire until Sept. 6, 1887. With this improvement one thousand pairs of shoes per day can be bottomed on the machine, and an operator in an Eastern shoe factory recently sewed the bottoms on twelve hundred pairs of women's shoes in ten hours.

Besides the above, there are several other patents on various improvements which have been added from time to time, and which run for different terms, the comparative value of which is, just now, one of the exceedingly "live" questions in the shoe manufacture. The machines, as originally put out, were leased for one dollar, the patentee to be compensated by stamps to be put on each pair of shoes made, equaling an average royalty to him of about two cents per pair. It is estimated that such royalty has been paid to the McKay Association on fully 500,000,000 pairs of boots and shoes, which, at the above rate, would equal $10,000,000. In his testimony on the trial before Judge Blatchford, Mr. McKay gave, as the returns to him of stamps purchased up to August, 1880, the number of 441,490,380. He also stated that there were at that time 1,011 licensees of these machines—the number of machines now in use being about 1,300. The royalties paid, while they seem trivial for single pairs of shoes, come to a considerable sum for manufacturers making several thousand pairs a day; and with these successive expirations of patents the trade have been anxiously looking for the time when they need pay no further royalties. The association, however, has from the first been constantly introducing machines with their later patented improvements, and their contracts with the lessees provide that the leases shall run until the expiration of "all" the patents, after which the lessees shall have the privilege of purchasing the machine for one dollar.

Many of the manufacturers had supposed that on the 14th of August they would be entitled to their machines for this nominal price, and need pay no further royalties, but, although the most important patents have expired, substantially all the machines in use contain some improvements covered by more recent patents. These the manufacturers are unwilling to do without, but most of them strongly object to continuing the payment of royalties as provided for in their leases. The association claim to have practically no machines now in use which would come under the one dollar purchase provision, but are selling non-royalty machines made according to their expired patents, and still claiming royalty on all others.

It is not unlikely that some of the questions involved will become matter of litigation, for, although the improvements introduced by the McKay Association have undeniably had a vast influence in promoting the boot and shoe manufacture, there is a very strong opposition in the trade to the continuation of these large royalty payments, and comparatively few of the lessees have ever taken the trouble to thoroughly inform themselves as to the full force and meaning of all the specifications of the elaborate agreement to which they bound themselves in signing their leases. The foregoing facts attest that the patentees have been munificently compensated for their inventions and improvements, but this is in no way a legal offset against, nor can it be made to invalidate any claims they may be able to maintain for patented improvements, the patents for which still have some time to run.

STEAM VERSUS SAILS IN OYSTER CULTURE.

A lively controversy is being waged in Connecticut between the owners of steam dredges and the sail boat owners with regard to the use of steam in dredging the natural oyster grounds of Long Island Sound. Last winter the State Legislature passed a bill prohibiting the use of steam dredges. The steam dredging men are trying to secure a reconsideration of the matter, looking to a repeal of the act next winter. The oyster trade of Connecticut is the basis of an important industry. It is said that there are 3,000 persons engaged in the business, and 10,000 who derive their living from it. Formerly, nearly all the oysters used for seed came from the Chesapeake Bay, but during the last few years they have been taken from the waters of the Sound. When the first steam dredge was put to work a few years ago it was a small affair, and did not meet with much opposition, but as the dredges have increased in size and number those in the business with sailing vessels found that they could not compete with them, and claimed that the steam dredges did very serious injury to the natural beds. There were seven steamers engaged in this work when the present law was passed. There are about 6,000 acres of natural oyster beds in the waters of the State of Connecticut, and it is stated that the annual average production of seed from these beds does not exceed 150 bushels of oysters to the acre, making a total annual production of 900,000 bushels. There are about 800 sailing vessels engaged in the oyster business. The average daily catch of one sailing vessel with three men is about 25 bushels. A sailing vessel averages about two and a half days' work each week, making a total weekly catch of 62½ bushels. A steamer with three men averages four days' work a week, with an average daily capacity of 500 bushels, making a total of 2,000 bushels per week. One steamer will, therefore, take the place of 33 sailing vessels, and the seven steamers, with 21 men, will displace 224 sailing vessels, with 672 men. It was claimed that unless the law was passed a monopoly would control the business, that the grounds were being seriously damaged, and that in the course of a few years the natural oyster beds would be out of existence.

The steam dredging men claim that so far from injuring the beds their operations are beneficial: that for every seed oyster removed, by the necessary stirring up and scouring of the shells and gravel, at the time when the water is full of newly spawned young, clean stools are secured for the "setting" of hundreds of oysters which would otherwise be smothered in the slime which naturally covers objects under water. Systematic dredging for seed therefore results in the steady extension of the area of the natural beds, and secures a plentiful setting of spat every season. The crop is, therefore, made more certain, abundant, and cheap. Further, the dredging is done at the season when star-fish are most abundant and destructive, and it is only by steam dredging that these pests can be economically captured and removed. Natural as well as planted beds of oysters are often completely destroyed by star fish and made permanently barren. The steam dredge is the only efficient remedy.

An important distinction should be made between dredging for seed and for market oysters. Natural beds have frequently been stripped by over-dredging during the fall, winter, and early spring, when oysters are in season. At such times there are no free-swimming spat in the water to "set" for a new crop. The oysters are taken and the ground left bare until a chance storm at some subsequent spawning time shall stir up the bottom and wash the dead shells and gravel clean and suitable for fresh stools for a new natural crop. Dredging for seed oysters is usually done in summer, the vacation of the oyster trade, when the more the bottom is disturbed the more plentifully the new crop will set.

The question at stake seems to be the old one between the progressive and the non-progressive men in every industry. It is safe to assume that the latter in this case, as in all others, will only succeed in delaying the inevitable.

THE FISHING FISH.

In our paper for December 28, 1878, we gave an engraving of a curious mode of catching turtles practiced in the West Indies, which consisted in attaching a ring and line to the tail of a species of sucker fish known as the remora. The live fish is then thrown overboard, and immediately makes for the first turtle he can spy, to which he attaches himself firmly by means of a sucking apparatus arranged on the top of its head. Once attached to the turtle, so firm is his gripe that the fisherman, on drawing the line, brings home both turtle and the sucker. The latter is then ready for a new excursion. The account we published stated that the white tailed species of remora (*Echeneis albicauda*, Mitch.) frequents our North Atlantic coast, and is sometimes taken in Long Island Sound, where it is known as the shark sucker. During the past few weeks sharks have made their appear-

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ance in considerable numbers around the wharves in New York city, and several of them have been caught with baited hooks.

Sharks have also made their appearance further up the Hudson River, above New York, and on the 15th of August, at Croton Point, 25 miles from this city, Mr. S. W. Underhill captured three of these monsters in a net that had been set for mossbunkers. One of the sharks measured 8 feet 9 inches in length, one 8 feet, and the other 7 feet 6 inches. In connection with these sharks a specimen of the remora was also taken, in length about 12 inches. Mr. Underhill kindly brought the fish to our office while it was alive. It exhibited its power of attaching itself by suction to the fullest extent, fastening itself to the sides of the vessel with great firmness. A remarkable peculiarity of this fish was its capabilities of changing color. When placed in the bottom of the pail and shaded from light its belly turned rapidly to a very dark slate color; but when the fish was brought up into the light, its belly quickly turned very white, like white paper.

The chief peculiarity of all these fish consists in an oval disk on the top of the head and the adjacent parts of the back, the surface of which is crossed by transverse cartilaginous plates, arranged somewhat like the slats of a Venetian blind; on the middle of the under surface are hook-like projections, connected by short bands with the skull and vertebræ, and their upper margin is beset with fine teeth. According to De Blainville, this organ is an anterior dorsal fin, whose rays are split and expanded horizontally on each side instead of standing erect in the usual way. By means of this apparatus, partly suctorial, partly prehensile by the hooks, the remora attaches itself to rocks, ships, floating timber, and the bodies of other fish, especially sharks, which it uses either for anchorage or for labor-saving transit.

TESTING FULL-SIZED BRIDGE COLUMNS.

A series of experiments has lately been made to determine the strength of wrought iron columns manufactured by the Phœnix (Pa.) Iron Company, and known as Phœnix columns. These tests were made in the Government machine at U. S. Arsenal, Watertown, Mass., and upon full sized columns of from 12 to 18½ inches sectional area of metal and from 8 inches to 28 feet in length. Twenty-two samples were submitted to ultimate compression strain. The elastic limit and deflection and the total compression are given in a table published by the American Society of Civil Engineers, from which it appears that they are stronger than theoretical formulæ heretofore used have made them; for example, a column 28 feet long, 8 inches diameter, or 40 diameters in length, having a sectional area of 12 inches, was compressed 0·19 of an inch under a load of 300,000 pounds, and gave way under 424,000 pounds, or 35,159 pounds per square inch of section. Another sample 25 feet long, of 18·3 inches sectional area, was compressed 0·115 inch under 300,000, and was crushed at a load of 659,000 pounds, or 36,010 pounds per square inch of section. The shortest sample, about one diameter in length, 11·9 square inches sectional area, showed only 0·008 of an inch compression at a load of 300,000 pounds, and was crushed at 680,000 pounds, or 57,130 pounds per square inch.

The loads sustained at various states of deflection were also observed and tabulated with the great care that characterizes the experiments made by Mr. James E. Howard, who has the handling of this splendid machine, the finest apparatus in this country. It is a new and important departure from old methods to test full-sized, complete members of engineering structures, in lieu of small samples of the material proposed for their construction, which was the only available way before this enormous machine was built by the United States Government. It is available for the use of manufacturers and others at a moderate per diem.

THE AMERICAN SCIENCE ASSOCIATION.

The opening of the annual session of the American Association for the Advancement of Science, at Cincinnati, was noticed last week. The secretary announced at its close that in attendance the meeting had been the most successful one ever held, with the single exception of the Boston meeting last year. More new members were received this year than ever before. The association now numbers two thousand members. The officers for the meeting next year, to be held at Montreal, beginning August 23, are as follows:

President.—Dr. J. W. Dawson, of Montreal, Canada.

Treasurer.—William T. Vaux, of Philadelphia.

General Secretary.—William Saunders, of London, Ohio.

Assistant General Secretary.—Prof. J. Eastman, of Washington.

The Permanent Secretary having been elected for five years, Prof. Putnam, of Cambridge, the present incumbent, will continue in office.

Vice-Presidents and Chairmen.—Section. A.—Prof. William Harkness; Section B.—Prof. T. C. Menhall, of Columbus, Ohio; Section C—Prof. H. Campbell, Bolton; Section D.—Prof. W. P. Trowbridge; Section E.—Prof. E. T. Cox, San Francisco, Cal.; Section F.—Prof. W. H. Dow; Section G.—Prof. A. H. Tuttle, of Columbus, Ohio; Section H.—Prof. Daniel Wilson, of Toronto; Section I.—Prof. E. P. Elliott.

Secretaries.—Section A.—Prof. H. T. Eddy, of Cincinnati; Section B.—Prof. Charles T. Hastings, of Baltimore; Section C.—Dr. Alfred Springer, of Cincinnati, Ohio; Section D.—Prof. Charles B. Dudley; Section E.—Capt. C. E. Dutton; Section F.—Dr. Charles Minot, of Boston, Mass; Section G.—Prof. Robert Brown; Section H.—Prof. Otis T. Mason; Section I.—Franklin T. Hough, of Lowville, N. Y.

Sixty-eight professors of science, directors of museums, army and navy officers, members of the Coast Surveys, chemists, etc., from all parts of the United States, were recommended by the Standing Committee for the honorary degree of "Fellows," and were elected by ballot.

The work done at Cincinnati, both in general sessions and in the several sections, was of considerable general as well as scientific interest. One of the earlier resolutions adopted was a hearty protest against the too common practice among colleges of conferring the degree of Doctor of Philosophy *honoris causa*. Provision was made for the reprinting of several volumes of the Transactions of the Association. A new committee, consisting of Prof. G. C. Swallow, of Missouri; Prof. Proctor, of Kentucky; Prof. James Hull, of New York; Prof. Winchell, of Missouri; Prof. Kerr, of North Carolina; Prof. Orton, of Ohio; Major Powell, of Washington, was appointed to plan and recommend a systematic and more accurate method of making State geological surveys.

The report that the geologists were disposed to withdraw from the association and set up a separate organization was denied by Prof. Swallow, who said that, though the geologists had organized the association, all they wished now was that there be a reorganization of some of the sections, and that a geological library be established, in which a record of all the geological discoveries and all the geological specimens be kept. A geologist could then know when he had made a new discovery, or whether or not a new specimen which he had in his possession had already been described. More than a hundred papers were read at length or by title in the several sections.

STEAM-BOILER NOTES.

The deterioration of the strength of boiler plates over the fire from exposure to intense heat, while defective conditions exist inside, either from imperfect circulation, the nascent steam not being swept off by the motion of the water, or from the accumulation of deposits or incrustation incident also to bad circulation, often causes bagging down of the plates, which, although apparently in contact with the boiler water, become practically overheated.

The same effect is sometimes produced by the use of blowers to urge the fire, particularly if clinkers are formed in the fire, which prevent the free passage of the air throughout the whole grate area. The blast passing through holes concentrates in a number of jets, which impinge on limited areas with increased local effect, and the intense heat not being transmitted with sufficient rapidity, the exposed surface of the metal becomes surcharged with heat and either softened or oxidized in detail, as the holes form in new places after trimming the fire. The effect is undue expansion or softening and stretching of the fire surface of the plate and bagging from internal pressure.

I. R. B. & Co. write for advice in the matter of their new steel tubular boiler, which has given trouble from bagging of the plates over the fire after only one week's use. We gather from their correspondence and that of the maker of the boiler, who thinks his work has not been fairly treated, that the boiler shell is made of Cleveland steel (thickness not given), is 48 inches diameter, 14 feet long, with 34 flues 4 inches diameter, spaced about ¾ inch to 1 inch apart, the lower row of flues being 8 inches from the bottom and 4½ inches from the sides of the shell. It is set 20 inches above the fire grates, and is used night and day, burning 180 pounds of coal (kind not given, nor area of grate).

At the end of about a week's use the plates over the fire were found bagged down about 1½ inches. The distorted plates were replaced by new ones, which began slowly to come down in the same way, and when about half as bad as the first ones the lower row of flues was taken out and the holes plugged, which seems to have stopped the difficulty. In answer to an inquiry as to the safety of the boiler we advised them to apply two braces to the boiler heads, unless they were of unusual thickness, the shell itself being, of course, safer and more efficient than it was before the flues were taken out, because of more perfect circulation of a larger body of water within the boiler.

By the removal of the lower row of flues the unsupported area of the heads below the flues may have been fully doubled, and the tendency of the pressure (which is not given) upon the part of the head will be to cause undue tension on the lower side of the flues, especially the middle ones, by the slight outward motion of the head. While this prying strain exists the under side of the flues is liable to corrosion on account of the direct action of the water on the minute particles of the metal that are exposed by the strain. When once this action commences it goes on in an increasing ratio as the wasted part gets weaker, and it may not show itself till too late to prevent an explosion. The four plugged holes take 16 inches out of the head in a horizontal line passing through their centers. A pair of braces for each head were, therefore, recommended for the prevention of this possible event. Twenty inches depth of furnace is not sufficient for bituminous coal, especially if the bridge wall is high and no air is admitted at the back of the furnace to complete the combustion. A high bridge materially affects the distribution of the heat over the lower plates of the boiler, and if our correspondents have such they would realize increased economy as well as safety by cutting it down and lowering the grates.

The boiler of the tug A. B. Ward exploded August 20, at Chicago, while the boat was in the river. The captain, Frank Butler, was hurled into the air and fell, fatally mangled but alive, upon the deck of a barge that the tug had in tow. William McDonald, a deck hand, and Ole Oleson, are missing. They are supposed to have been killed. Michael McDonald, the fireman, and Frederick Whitaker, the cook, were slightly injured.

The cause of the explosion is unknown, though in the opinion of Stewart H. Moore, United States Inspector of Boilers, the disaster was due to low water, as the iron of the boiler shows signs of having been red hot. Inspector Moore states the boiler was built in 1877, and was inspected April 29 last and found to be in excellent condition, withstanding a hydrostatic pressure of 165 pounds, or 55 pounds more than the required maximum. It was of three-eighths boiler iron, which appears to be of good quality.

A Remarkable Explosion and Fire Caused by Lightning.

The city of St. Louis, Mo., has an almost world-wide reputation for the excellence of its flour. The other day (August 12) one of its large flouring mills, which was also one of the oldest institutions of the kind in the West, was utterly destroyed by lightning, explosion, and fire, occurring in the order named, and so rapid was the course of the disaster that the workmen could not all escape from the burning and falling building. Four were killed and six others seriously injured.

The Atlantic Flouring Mills, the establishment referred to, were built 35 years ago on Main and Plum streets, occupying, according to the St. Louis *Miller*, 140 feet on the former by 125 feet on the latter, and five stories in height. A lightning stroke on the evening of the day above named ignited the mill dust in the upper part of the building, causing an explosion, which split the walls to their foundations, and immediately the whole took fire and is said to have been consumed in about half an hour. The mills were not long since supplied with the latest improvements in milling machinery. The property destroyed was valued at $325,000.

The enterprise and resources of the proprietors are indicated by the promptness with which they supplied themselves, probably at great expense, with other mills as a temporary substitute for the demolished ones, wherewith to meet their business engagements, and also by the vigor with which they have set about rebuilding on a scale equal to if not greater than that of any flouring mills in the United States.

According to their circular issued to their patrons, the new mills will occupy a block 274 feet by 165 feet, and be connected with several railroad trunk lines, filled with the very latest improved machinery, and turn out flour of the best quality.

Inventors have an opportunity now to study out new safeguards against disasters such as we have described, either by preventing the escape of the light, impalpable dust from the conveyers, bolting chests, coolers, and packers, or to treat the dust with steam or humid air in the top of the mill, so as to render it inexplosive. Fireproof metal casings and conduits may also be practicable and useful as preventives of the spread of fire.

The Retreating Comet C.

At this writing (August 24) Schaeberle's comet has passed its period of greatest brilliancy. As it is now rapidly retreating into space it is evident that it must rank far below comet B as an object of popular interest. For several nights it has presented a fairly conspicuous object in the northern sky, directly under Ursa Major, and, though accounted by astronomers twenty-five times brighter than when it first appeared, it bears no comparison with the comet of 1861, which it was expected to rival. Under a low magnifying power the nucleus appears simple and surrounded by a sharply defined sphere of light. The tail is short and brush-like. The comet was nearest the earth August 20. The weather has not been favorable for photographic or spectroscopic observation.

Instinct or Reason?

A short time ago a fine specimen of a water spaniel gave birth to a litter of five healthy pups at No. 813 Hempstead street, and a few days afterward a servant kidnaped two of them. At first the mother did not seem to display any feeling of regret, but it soon became apparent that the supply of milk was intended for five instead of three mouths. This fact became so patent to the mother that she sought for a remedy, and discovered it in the shape of two kittens, which she boldly took from their quarters under a lumber pile in the same yard. These two adopted children were placed with their stepbrothers and sisters, and were fed by their new guardian or stepmother. She could not have mistaken them for her offspring, inasmuch as she knew of their existence before her babies were taken from her, and saw them daily. She could have taken the kittens before had she thought they were part of her family, but it was only when she was obliged to find relief for her breasts that she resorted to the tactics mentioned.—*Missouri Republican.*

The Coast Survey.

Professor Julius E. Hilgard, for twenty years assistant in charge of the office, has been placed in temporary charge of the Coast and Geodetic Survey. It is understood that he will be appointed superintendent to succeed the late Captain Carlile P. Patterson.

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Give the Baby a Drink of Water.

A city physician attributes a large part of the excessive mortality of children in hot weather to the failure of nurses and mothers to give them water; indeed more children are said to die (directly and indirectly) from deprivation of water than from any other cause. Infants, he says, are always too much wrapped up, and in any case would perspire very freely. The water lost by perspiration must be supplied. As Dr. Murdoch stated in his paper on cholera infantum, "The child is thirsty, not hungry; but not getting the water, which it does want, it drinks the milk, which it does not want." The consequence is that the stomach is overloaded with food which it cannot digest, and which soon ferments and becomes a source of severe irritation. Then follow vomiting, purging, and cholera infantum."

To prevent this, the principal scourge of infancy, the doctor says: "Have water—without ice—always accessible to the child, who will then refuse sour milk and will eat only when hungry. Water is the great indispensable article for the preventive treatment of children in hot weather. It is important enough to nursing children, but is life itself to those reared on the bottle."

THE PARIS ELECTRICAL EXHIBITION.

[*Continued from first page.*]

Two, five, ten, and twenty light machines are used in the Exhibition to light the grand aisle and other halls on the first floor. The machines are exhibited by Messrs. Sautier, Lemonnier & Co., owners of the new Gramme patents in France; also by the Spanish Electrical Society and by the Gramme Company. The Gramme Company make four sizes of machine. No. 1, for 1 to 2 lamps; No. 2, for 2 to 3 lamps; No. 3, for 6 to 8 lamps; No. 4, for 12 to 16 lamps. Nos. 3 and 4 have not been experimented with as yet, but it is thought they will excel Nos. 1 and 2.

The Weston dynamo machine exhibited differs only slightly from those already described in our columns. It will be observed by reference to the engraving that the field magnet is compound, being composed of a number of electro-magnets with cylindrical cores.

The Siemens steam dynamo used in connection with the electric railway is well represented by our engraving. The generator and steam motor are mounted on a common base, the motor being a rotary steam engine.

The car shown in Fig. 5 does not differ materially in appearance from an ordinary street car. The electric motor placed under the car floor is entirely inclosed. It receives its current from the rails, and the power is transferred to the car axles by means of pulleys and belts.

Other important exhibits in the various departments will be described in later issues. About one-third of the 1,800 exhibitors are from countries other than France. A list of the American exhibitors appears below. Many of them are represented in two or more classes. The Edison exhibits are naturally attracting much interest. They appear in each of the six general groups of exhibits, and represent fifteen different classes. They are shown in two salons, which contain a complete illustration of the Edison system of incandescent lighting, as well as representations of all his inventions and discoveries. It is remarkable that the labors of a single investigator and inventor should cover a field as broad almost as the entire scope of an international exhibition.

On the 25th of August an electrical fire broke out in the reading room of the Exhibition. It was occasioned by a defect in the fitting up of some incandescent lamps. The alarm was quickly given and the fire was extinguished before it had spread far. In attempting to tear out the wires with his hands a fireman received electrical shocks and was twice knocked down. A scientific commission, headed by MM. Dumoncel and Breguet, afterward made an examination of the connections of the various exhibitors, and there is now no further danger to be feared.

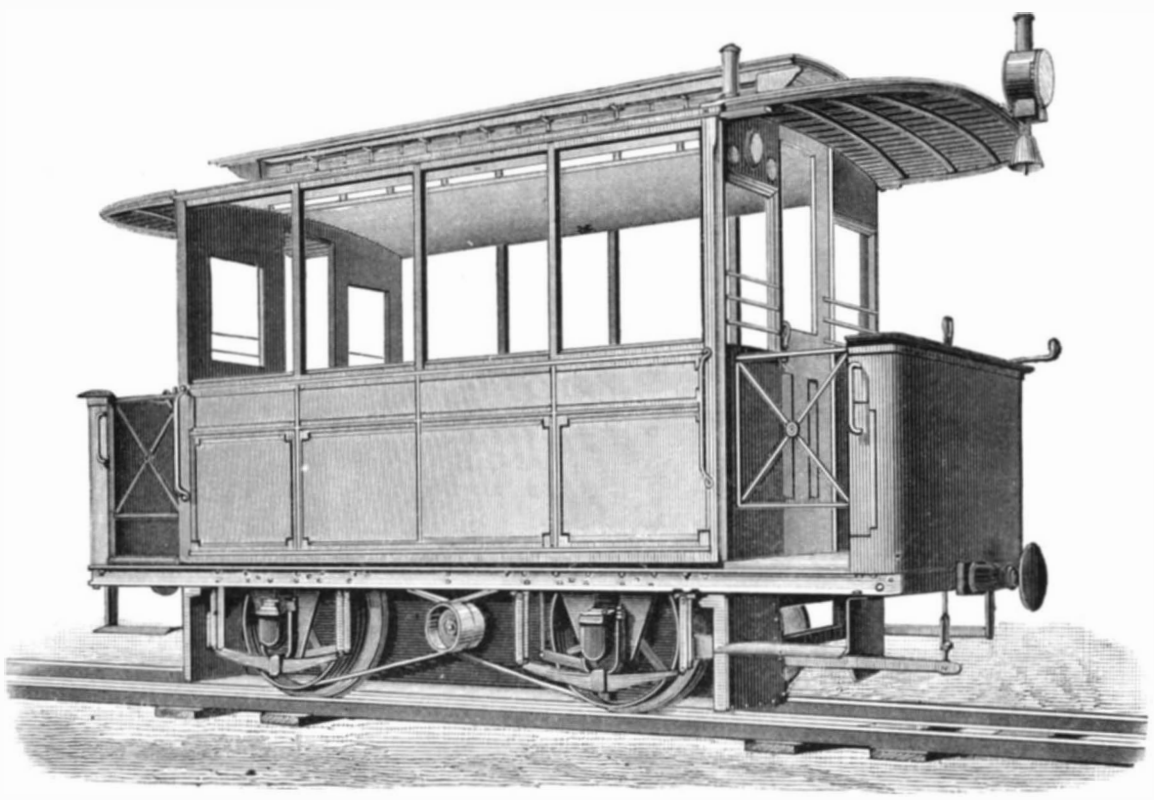
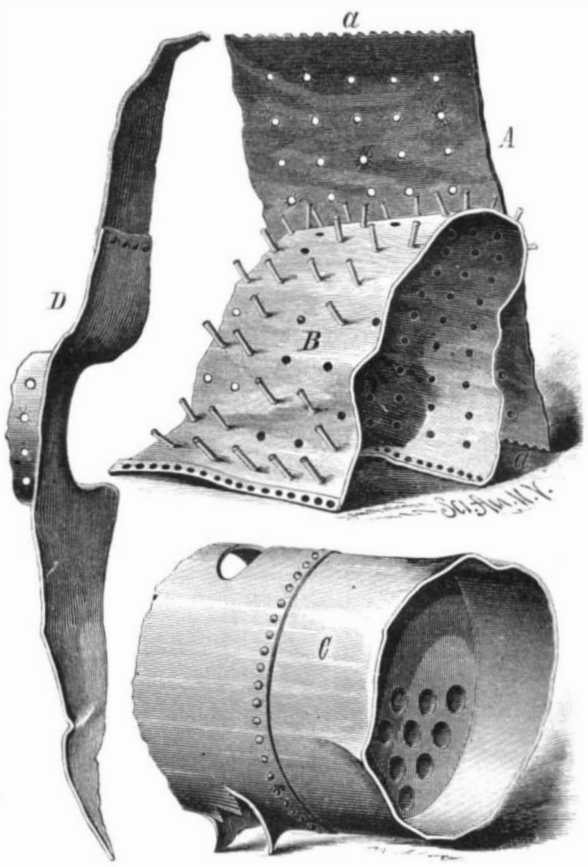


Fig. 5.—ELECTRO-MOTOR CAR ON THE ELECTRIC RAILROAD AT GROSS-LICHTERFELDE.

PARIS ELECTRICAL EXHIBITION OF 1881—LIST OF AMERICAN EXHIBITORS.

Thos. A. Edison, Menlo Park, New Jersey.
J. Morgan Eldredge, Philadelphia, Pa.
Electro-Dynamic Company, Philadelphia.
August Partz, Philadelphia.
Theodore Schmauser, Allegheny City, Pa.
U. S. Signal Office, Washington, D. C.
Joseph M. Hirsch, Chicago, Ill.
Milo G. Kellogg, Chicago, Ill.
Standard Electric Light Co., New York.
U. S. Electric Light Co., New York.
Weston Electric Light Co., Newark, N. J.
White House Mills, Hoosac, N. Y.
Wilson P. Dodson Philadelphia.
Alex. H. Ege, Mechanicsburg, Pa.
Hoosac Tunnel Trinitro-glycerine Works, North Adams, Mass.
William J. Philips, Philadelphia, Pa.
J. F. Bailey.
Alex. Graham Bell, Washington, D. C.



WATERTOWN BOILER EXPLOSION.

Sumner Tainter, Washington, D. C.
Charles Williams, Jr., Boston, Mass.
Conolly Bros. & McTighe, Washington.
George Cumming, New York.
Electrographic Manufacturing Co., New York.
Elisha Gray, Highland Park, Ill.
Pond Indicator Co., New York.
Chas. W. Hubbard, Boston, Mass.
A. E. Dolbear, Somerville, Mass.
E. W. Serrell, Jr., New York.
Clinton M. Bell, Troy, N. Y.
Photo-relievo Co., New York.
W. G. A. Bonwill, Philadelphia.
Electric Purifier Co., New York.
Robert Hasse, Indianapolis, Ind.
Volney W. Mason, Providence, R. I.
U. S. Patent Office, Washington.
John Michels, New York.
Smithsonian Institution, Washington.

Charred Bran for Preserving Fruit.

The use of charred bran for preserving delicate fruit while on the road to market, bids fair to solve the problem which has so long perplexed our millers. Converted into charcoal, the light and slippery product of the mills ceases to be unmanageable; and it is quite likely that a large local demand for charred bran will arise in the vicinity of most mills, for packing not only quickly perishable fruits like peaches, plums, and grapes, but also apples and other firmer fruits, for storage as well as for transportation.

WATERTOWN BOILER EXPLOSION.

To the Editor of the Scientific American:

I went to examine the boiler lately exploded near Watertown, this county, by which three lives were lost. The fragments of the exploded boiler show the terrible nature of the force at work in this explosion. It is a difficult matter to learn any particulars as to the cause which might lead to the explosion of this boiler, as no one who knows much about it now lives. As to whether the water was low or not we do not know. The mill had been idle for some time, and the engineer wanted to clean out this boiler before starting up, but the owners said no, "Go ahead and fire up." He did so, and in the afternoon the explosion occurred, probably about eight hours after starting. There was no coroner's inquest, consequently there is no evidence to give as to the previous condition of the boiler.

In my examination of the remains of the boiler I find that the stay bolts were *eight inches from center to center*, and a large number of the bolts remain in the fire box sheets yet, showing that the outside or shell of the box tore loose, and the piece represented at A is the shell of the fire box, which also goes to form the top of the boiler. The edges, *a a'*, were respectively riveted to the bottom of the legs of the fire box, and gave way through the rivets along this edge and opened up and straightened out flat, as shown in the cut. This piece was found 150 feet or more from its starting point. It went up about 30 feet, and struck and cut off a gum tree about a foot in diameter. A large number of the stay bolt holes show that at some past time there has been sufficient strain on them to start them, as the holes show cracks radiating from the circumference; but these cracks do not go through the sheet, consequently they would indicate nothing on the outside except a small indentation around the head of bolts. The flues were all torn out, and the fire-box, B, was smashed into a shape somewhat resembling a hat if taken by both hands and smashed together.

One piece of the boiler, C, including the front flue sheet, remains but little injured. One piece, D, immediately in front of the fire-box and forming part of the front leg of boiler, is in a curious shape. It is about 10 feet long and 2 feet wide at its widest place, but each end runs off to a point. The crown sheet shows no indication of excessive heat, as the stay bolts are yet in it, which would not have been the case if the sheet had been left bare of water.

As near as I can get at the cause of this explosion I am led to believe that it was caused by an insufficient number of stay bolts, and that the explosion took place in the fire-box end of the boiler, the shell of the fire-box blowing up away from the fire-box, and at the same time the firebox was smashed in and the other parts of the boiler were torn to pieces.

The boiler was of the common type of portable boilers, with fire-box at one end, and it seems to me criminal carelessness on the part of the builders to construct a boiler with stays *eight inches* apart, and there should be some way to prevent this careless way of constructing boilers. The iron seems to be of fair quality, but shows laminated edges in some of the fractured pieces, showing that it is not of the best quality.

I have frequently examined this kind of a boiler after explosions, and have invariably noticed this laminated appearance; and in this particular case I noticed that where the stay bolts had partly pulled out or started to pull out at some past time, the cracks around the holes passed only through the inside layer of the boiler plate. This fact leads me to believe that explosions occur frequently from this laminated condition of the plates or imperfect weld of the plate in manufacture.

Marietta, O., July 30, 1881. WM. M. MORSE.

The Great Heat of the Sun.

Prof. S. P. Langley has made the following calculation: A sunbeam one centimeter in section is found in the clear sky of the Alleghany Mountains to bring to the earth in one minute enough heat to warm one gramme of water by 1° C. It would, therefore, if concentrated upon a film of water 1-500th of a millimeter thick, 1 millimeter wide, and 10 millimeters long, raise it 83⅓° in one second, provided all the heat could be maintained. And since the specific heat of platinum is only 0·0032, a strip of platinum of the same dimensions would, on a similar supposition, be warmed *in one second* to 2,603° C.—a temperature sufficient to melt it!

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The Manufacture of Needles.

From a lecture on "Steel in Modern Times," by Mr. S. Perissé, reproduced in a recent number of the *Revue Scientifique*, we take the following notes on the curious and interesting needle manufacturing industry:

The needle, says Mr. Perissé, passes through the hands of eighty workmen before it is ready to deliver to the trade; and, if we take into consideration that these articles cost at the very most only $2 per thousand, on an average, we find that the 8,000 operations are remunerated by the sum of 20 cents.

Owing to the progress effected in the art of drawing steel into wire, cast steel has been principally employed for some years past. Formerly, in France and Germany, manufacturers used iron wire, which was converted into steel during the course of the operation. The manner of manufacturing differs but little. At Borcette, the center of needle production of the continent of Europe, there are five series of operations involved in the manufacture: (1) Conversion of the wire into needles in the rough; (2) tempering and annealing; (3) polishing; (4) softening of the polished needles; (5) putting up into packages.

1. *The Conversion into Needles in the Rough* involves twenty operations, the principal ones of these being gauging the wire, cleaning, reeling, and cutting into pieces of a length equal to two needles. Sharpening or pointing is done by means of grindstones. By the aid of a leather thumbstall the workman holds fifty wires at a time. The latter become red hot by friction on the stone, and a constant stream of fine particles of steel and stone is thrown off, which formerly brought about phthisis in the workman after a time, but the adoption of powerful ventilators has now remedied all that. After pointing, the wire is cut in two, the head is flattened, and it is then annealed. Then the eye is punched in the head by means of a steel punch, the operation being performed by children in less time than it takes to describe it. Other children "hole" the needles, that is, remove the particle of steel detached by the punch. After this the heads are hollowed, sorted, and, when necessary, cemented.

2. *Tempering and Annealing* of the raw product requires nine operations, but they are performed with lots of 30 pounds weight, each containing more than 300,000 needles.

3. *Polishing* is the longest operation, although a million are polished at once. It requires five operations, each of which is repeated seven or eight times. The needles are put into rolling cylinders along with small hard stones and oil of colza. The stones gradually become crushed, and the friction of the particles during the motion of the rollers effects the polish. The last polish is performed with oil alone and coarse bran.

4. *The Sorting of the Polished Needles* involves five operations, and, after burnishing, which is a very delicate and important process and that which gives the luster, the needles undergo the last operation of being put up into packages.

IMPROVED HORSE HAY-FORK.

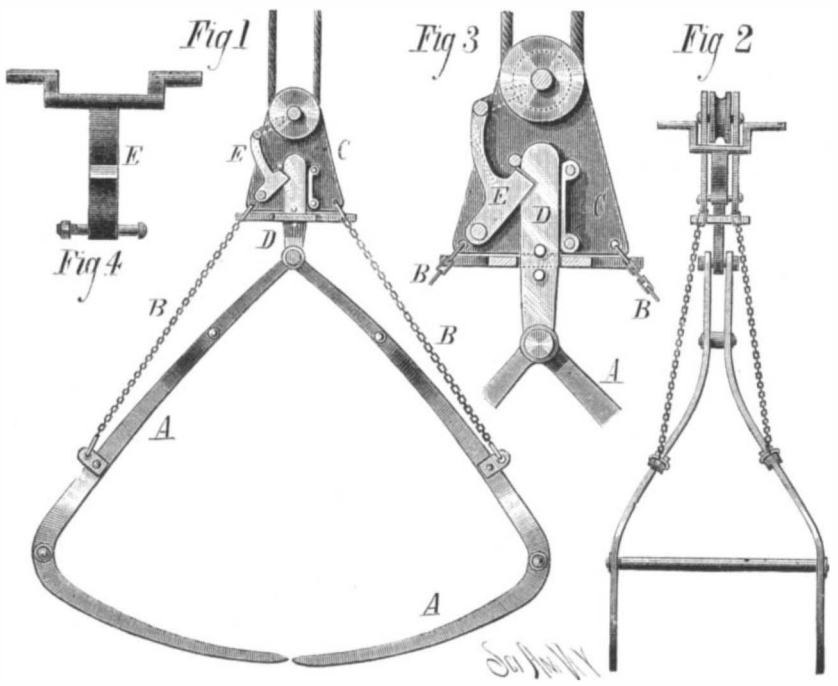
We give an engraving of an improved horse hay-fork recently patented by Mr. Townsend Albertson, of Mineola, N. Y. This fork, although very simple in its construction, is very convenient and easily managed, and is perfectly automatic in discharging its load.

The general form of the fork is shown in Fig. 1, and Fig. 2 is a side view, showing the double arrangement of the fork. Figs. 3 and 4 are detail views of the catch and releasing mechanism.

The fork tines are curved inward, as shown in Fig. 1, and are connected in pairs by a crossbar, as shown in Fig. 2. The shanks of the tines are hinged together at their inner ends, and connected with a catch, D, carrying a horizontal plate. The shanks of the tines, near the bends, are attached to chains, B, which are connected with the lower corners of the plates of the pulley block, C. The fork is raised and lowered and carried along by a rope that passes under the pulley in the block.

A latch, E, is pivoted between the plates of the pulley block, C, and is capable of engaging a notch in the catch, D, when the latter is pushed up into the pulley block. The latch, E, is provided with trip arms (as shown in Figs. 2 and 4), which engage with cleats or other stops on the track upon which the carriage runs.

When the fork is drawn back and lowered upon the load the tines are separated and supported by the chains, B. As the tines are thrust into the hay their curved shape causes them to move inward slightly, and the pulley block, C, is drawn downward so that the catch, E, will be engaged by the latch, E. When the pulley block is raised by the rope the load is lifted more or less by the catch, D, and when the load is carried to the point where the latch, E, strikes a stop and releases the catch, the load drops.



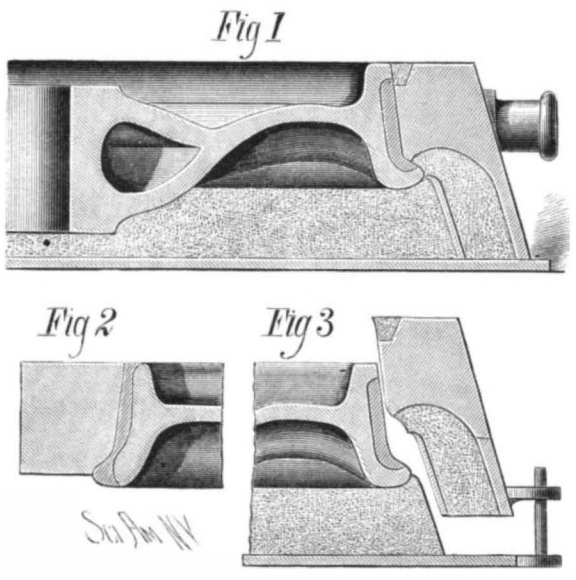
ALBERTSON'S HORSE HAY-FORK.

Lemon Juice in Diphtheria.

Dr. I. R. Page, of Baltimore, calls the attention of physicians, in the *Medical Record*, to the topical use of fresh lemon juice as a most efficient means for the removal of membrane from the throat, tonsils, etc., in diphtheria. He states that in his hands it has proved the best agent that he has as yet tried for the purpose. He applies the juice of the lemon to the affected parts every two or three hours by means of a camel's hair probang. In eighteen cases in which he has used the remedy the effect has been all that he could have wished. He finds that several of his professional brethren are prepared to give the same favorable account of the remedy.

IMPROVEMENT IN CASTING CAR WHEELS.

Considerable interest has lately been aroused among railway managers in favor of what is known as sand flange car wheels, and a great deal is claimed for them on account of their superior strength, durability, and largely increased mileage. All past attempts to make sand flange wheels have been mere experiments, and, as a rule, have been failures. It must, therefore, be inferred that the means heretofore employed for moulding them have not been satisfactory, and the results too uncertain to be appreciated or adopted by the practical wheel makers, many of whom have strong preference for sand flange wheels.



TAWCETT'S IMPROVEMENT IN CASTING CAR WHEELS.

Fig. 1 in the engraving is a section of the improved flask for moulding the flange of chilled car wheels in sand, showing the position of the flask when rammed full of sand. The inner or dividing ring, B, is made conical, and serves as a parting line for separating the two bodies of sand, and allows all the sand under the pattern to remain in the usual manner on the bottom plate, A, as shown in Fig. 3, and by its peculiar construction carries the sand that has been rammed on the upper side of the flange and holds the sand between the rings while the flask is being lifted off to allow removing the pattern and finishing the mould.

This form of a flask combines the best and most desirable features of construction, and is designed for long-continued regular work. This method of moulding insures neatness and cleanliness in carrying on the work and obviates the necessity of loose parts. Where economy in moulding, combined with accuracy in casting, is an object to be accomplished, this flask has been found very satisfactory.

Fig. 2 is a section of the ordinary chill, showing the chill in contact with the flange of wheel, and its effects on the rim of the wheel.

Further information in regard to this invention may be obtained by addressing W. Tawcett, Omaha, Nebraska.

Poteline.

The *Chronique Industrielle* states that M. Potel has recently communicated to the French Société d'Encouragement a new compound, which may be employed for preserving meat and hermetically sealing bottles, flasks, etc., or for making an artificial marble for the manufacture of various useful and ornamental articles. It is composed of glycerine, gelatine, and tannin. To preserve meat the inventor covers it with this new product, rendered liquid by exposure to a temperature of 90° to 100° C. The compound hardens very quickly and prevents access of air to the inclosed meat. When it is desired to offer the latter for sale the covering is simply torn off. The inventor has made many experiments during the past year, and has found that meat coated with the product could be kept from thirty to sixty days, and at the end of that time be apparently as fresh and sweet as any meat exposed for sale by butchers.

Sulphate of baryta or zinc white may be added to the compound to make it opaque, and it may be dyed of any desirable tint by means of ordinary vegetable colors when employed for ornamental purposes.

A Large Raft.

An unusually large raft of timber was recently floated down the Hudson. It was 900 feet long and 34 wide, and contained 254 pine logs, varying from 70 to 96 feet in length and from 18 to 30 inches in diameter. The logs were cut during the past winter in Ontario, Canada, near Capetown, Linden, and Onondaga. They were floated down to Toronto, on Lake Ontario, and on June 24 last they began their journey to Boston, in care of Capt. Edward Locke. They were made into a raft, and towed in three days and a half across the lake to Oswego, where they were separated into two rafts of six cribs each and a third raft of seven cribs. These were towed through the Erie Canal by John Wells, of Oswego. The journey occupied thirty-one days. The three rafts were then united into one large raft with two sections abreast, and floated down the river, traveling only on ebb tides. On its arrival at Gowanus Bay, Brooklyn, the raft was prepared for towing to Boston. The logs were chained together, and 113 logs from Pennsylvania were added, making a raft 1,300 feet long and 64 feet wide. The value of the raft was put at $25,000. The cost of towage $3,500, or one-third less than it would have cost to send the logs by rail.

Sensibility of the Telephone.

Every one knows that the very feeblest currents produce audible sounds in the telephone, which is more sensitive than any galvanometer to feeble currents. M. Pellat lately declared that the heat necessary to warm a kilogramme of water one degree would, if converted properly into the energy of electric currents, suffice to produce in a telephone an audible sound for ten thousand years continuously.

Carbon Electrics.

The galvanic properties of carbon have been closely examined by Dr. Hanichi Muraoka, a Japanese student at Strassburg. He determined the specific resistance and the change of resistance with increase of temperature of all kinds of hard carbon, including Siberian graphite, gas-retort carbon, the artificial carbons used for electric lighting by several well-known firms, and even the graphitic compound used in Faber's lead pencils. The specific resistance (at 0° C.) of the last was 952, while that of the first was 12·2. The artificially prepared carbons ranged from 36·86 to 55·15. In all, however, the resistance *decreased* with a rise of temperature, the coefficient of decrease being greatest for the Siberian graphite, least for a carbon pencil prepared from coke by Heilmann of Mühlhausen. This result entirely confirms the recent researches of Siemens and Beetz.

The thermo-electric powers of the various samples of carbon were also determined, with respect to that of graphite; their thermo-electromotive force was in every case + to graphite, and varied from 423 microvolts for the Faber pencil carbon to 9·26 microvolts for the gas retort carbon (of Parisian manufacture) used for battery plates.

A Railway on Stumps.

In the upper part of Sonoma county, Cal., a railroad track crosses a deep ravine upon the upright trunks of tall trees, which have been sawed off upon a horizontal line. In the center of the ravine a firm support is furnished by two huge redwood trees which have been lopped off seventy-five feet above the ground.

Sewing in a Boston Public School.

The Boston papers give favorable accounts of the recent exhibition in that city of the results of the instruction in sewing in the Winthrop School—a girls' school with six grades. In the three lower grades they have lessons of an hour each twice a week, and in the upper three classes once a week. The pupils furnish their own work, bringing the materials from home, the city having no expense except for needles and thread, in cases where the parents do not sup-

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ply suitable sizes and quality. They are taught to sew in the best manner with rapidity; are taught the various stitches known to the artist in needlework; are taught to make every variety of children's garments under the outer, every variety of undergarments for ladies and gentlemen; all branches of dressmaking, cutting, and fitting with facility, all branches of needlework in tailoring; are taught the art of making and ornamenting table and bed linen, fancy work of endless variety, including fine lace work and embroidery. The exhibition of work was remarkably neat and tasteful, some of it being exquisite in design. The effect of the work upon the pupils is said to be excellent in every way.

Correspondence.

The Bell Telephone.—The Decision of Judge Lowell.

To the Editor of the Scientific American:

In a number of your late issues you have had some interesting articles on Judge Lowell's late decision in the Bell telephone suit against certain parties for alleged infringement. I have read the opinion of the court in the above case (published in SCIENTIFIC AMERICAN of August 27.) with much care, and desire to say a few words upon the same, as I view said opinion as not justified before an intelligent host of American inventors, thinkers, and writers. To be granted too much by such decisions brings our patent system into disrepute, as affording monopolies the power to control entire fields of useful invention. By careful examination of the field in dispute I realize that the desire of the Bell monopoly is to gain, by decisions of courts, the only right to use electricity to convey intelligence by vocal sounds. There is no fight over apparatus, no fight over the means employed to vary the current; the monopoly simply asks to have the current set aside for their use, whether said current is *undulated*, *vibrated*, *intermitted*, *pulsated*, or *disturbed*.

Now let us quote the most astounding part of said decision: "But Bell discovered a new art, that of transmitting speech by electricity, and has a right to hold the broadest claims for it which can be permitted in any case." It is a fact well known that many others in the same line of experiment, before Bell's patent of 1876, were in sight and in *hearing* of the desired result. They were all using a current, and were trying different plans of using said current, and had succeeded in a partial manner by *disturbing* a current of electricity. Mr. Bell found a more effective way of using the same current. Just as well give McCormick the only *right* to cut grass and grain because he did it better than any who worked before him.

By all means give Mr. Bell his every due—give him credit for being a persistent worker, and give him all he has invented; but it seems very inconsistent to confer on him the only right to use a vibrated or undulated current. Look at the facts: Reiss, Gray, Dolbear, and others, *prior* to Bell's patent of 1876, were working hard and strenuously with this old, *disturbed*, *varied*, and *vibrated* current, getting groans, music, and words out of it, and now all the hosts of electricians of our country are to see another step in and take away their old current.

What I desire is that each inventor shall fully be entitled to use what he invents and brings forward, and no more.

As the Bell telephone stands to day it looks as if it is next to impossible to obviate the permanent magnet, the induction coil, and current, but if some inventor can find a means of using electricity and its established powers in the transmission of vocal sounds, *in a manner and by apparatus not patented by any one else*, that an enlightened public sentiment and a high and honorable court of last resort should protect all alike. How will Mr. Reiss over in the old country, and in our own land of rights and liberty how will Elisha Gray, feel when that little current, so subtle, so uncontrollable, had finally been taken from him? How will my old friend Dolbear feel, too, after *varying* the current, away back yonder, years ago? In fact, what will be the wonder and surprise of the hundreds of intelligent professors who have in years and years been using intermittent currents and getting sounds and songs, when they learn that they are forbidden to undulate a current in any endeavors to make a machine which will talk at the other end of the line?

I hope to hear others speak out and give their views on this subject.

GRAVITY.

Fire from Milk Pans.

To the Editor of the Scientific American:

The house of Mr. Henry Goulding, of Dover, Mass., caught fire a few days since in a very original way. It was one of those days when the sun was "shining in his strength," that one of the family observed smoke issuing from the clapboards on the sunny side of the house, and on examination it was found that a hole several inches long had been burned entirely through the clapboards and inner boarding of the house (together at least 1½ inches thick), and a few minutes would have sufficed to render the destruction of the house certain, with the limited means at hand for extinguishing a fire.

A bucket or two of water served to remove all present danger, and on searching for the cause it was found in a pile of bright tinned milk pans, a few feet distant, one or more of which were so placed as to concentrate the rays of the sun upon a few square inches of space on the surface of the clapboarding of the side of the house.

We are all familiar with the story of Archimedes burning the ships of the enemy by reflecting the rays of the sun upon them; nevertheless there would have been another unaccountable fire but for the timely discovery of this freak of nature, or rather chance.

STEPHEN MOORE.

Newton, Mass., August, 1881.

Temperature Observations in the Comstock Mines.

Recent temperature observations at Virginia City, Nevada, show the heat of the Foreman shaft to increase with the depth as follows:

Depth.	Temperature.
100 feet.	50½ degrees.
200 "	55 "
300 "	62 "
400 "	60 "
500 "	68 "
600 "	71½ "
700 "	74¾ "
800 "	76½ "
900 "	78 "
1,000 "	81½ "
1,100 "	84 "
1,200 "	89¼ "
1,300 "	91½ "
1,400 "	96½ "
1,500 "	101 "
1,600 "	103 "
1,700 "	104½ "
1,800 "	105½ "
1,900 "	106 "
2,000 "	111 "
2,100 "	119½ "

The temperatures were ascertained by drilling at the successive levels holes not less than three feet deep into the rock, and inserting a Negretti and Zambra slow-acting thermometer (of the pattern adopted by the Underground Temperature Committee of British Association, and standarized at Kent) into the hole, closing the hole with clay, and leaving the thermometer for twelve hours—not less than three holes being tried at each point.

Commenting upon these results the Virginia City *Enterprise* calls attention to the circumstance that though there is on the whole a steady increase of temperature as depth is attained, the increase of temperature is not regular. For instance, the rock at the 400 is two degrees cooler than at the 300 level; between the 400 and the 500 levels there is a difference of eight degrees; while in other places an additional depth of 100 feet shows but a slight increase in the temperature. Thus at the 1,800 level the temperature is 105½ degrees, while at the 1,900 it is but 106 degrees, an increase of but one-half a degree. This difference is undoubtedly owing to the character of the rock at the points where the holes were made; therefore it would be of great interest to have, in connection with the temperature, a description of the rock; not only the kind of rock, but also the nature of the same, whether carrying much lime, gypsum, or iron pyrites. It would probably be shown that where there was much lime there would be an increase of heat not warranted by the increased depth, and the reverse where lime was absent.

A Peculiar Property of Gutta Percha.

It is a well-known fact that when gutta percha is placed in water having a temperature of 60° to 70° C., it becomes very plastic, and may be used to receive very delicate impressions. Not so well known, however, is the information that the softened gutta percha becomes very elastic toward severe shocks, that it will bear blows from large hammers, and allow itself to be thrown against a strong wall without showing any indication of the result, while at the same time it is so susceptible to gentle pressure that it is capable of receiving the slightest of impressions.

This peculiar property is possessed by other plastic bodies, though in a less degree, as, for instance, freshly kneaded bread. It is considered as resulting in consequence of the occluded air contained in the substance.

The following simple experiment demonstrates the correctness of the above suggestion: Two spheres of equal weight are made of gutta percha which has been softened in water at 70° between the palms of the hand. One of these is placed on a card, and the air removed from the sphere by exhausting it under the receiver of an air pump; the other is retained for comparison. Both spheres, from their weight, will assume the form of round cakes, but the one under the air pump will swell considerably and exhibit a wrinkled surface. The increase in volume often more than doubles its original size. If the swollen piece is permitted to harden under the receiver of the air pump and then broken with a chisel, its cross section will appear honeycombed like the interior of a loaf of bread, while the fracture of the other piece will only show small cavities. Very dense gutta percha does not swell under the air pump, but if placed under mineral oil and made empty a voluminous evolution of air from the gutta percha will take place.

After the air is again admitted under the receiver it will be found on examining the gutta percha that it has lost the property of hardening on cooling. It has become like tough greasy leather. A voluminous evolution of air was also observed when clay, putty, and kneaded bread were examined under oil in vacuo similar to the above-described treatment of gutta percha.

The same phenomenon was observed when a sample of gutta percha, which had been softened in an air bath, was treated as above; in this case a longer time is required for the heating, as the heated air is very slow in giving the amount of required heat.

With some bodies the inclosed air plays an important part in affecting its mechanical properties; thus, clay, for instance, may be somewhat compressed by means of a piston in a cylinder, but as soon as the pressure ceases it resumes its former volume.

The densest of clay when placed under the air pump will become covered with numerous fine crevices (small as a hair), which close when the vacuum is sufficiently reduced.—*F. Kick, Dingler's Polytechnis. Che. Journal*, 240, 363.

Danger in the Westward Traffic in Calves.

The recently appointed Treasury Cattle Commission, sitting in Chicago, have just issued the following circular, addressed especially to the Governors of the States and Territories west of the Alleghanies:

The Treasury Cattle Commission, appointed by the Secretary of the Treasury in pursuance of an act of the last Congress, deem it their duty to call your attention to the imminence of the danger to which herds in the States and Territories west of the Alleghanies are exposed from the traffic in dairy calves, which is becoming a very common one between these States, now happily exempt from the contagious pleuropneumonia of cattle. That a very large proportion of our country has up to this time remained exempt from the dangerous malady, is owing chiefly to the fact that the current of our cattle traffic has hitherto been mainly from the West toward the seaboard. But the business of purchasing calves from the Eastern dairy districts, and scattering them throughout the Western States and Territories, which has within a year or two past assumed such mammoth proportions, has augmented the danger to which the uninfected districts are exposed tenfold; and if it is permitted to go on unchecked, the danger of a general infection of the great cattle growing and grazing regions is imminent. We therefore call upon you to use whatever influence you may legitimately bring to bear upon the people of your State to discountenance and discourage a traffic that is fraught with such danger to their material interests. The district known to be infected with the scourge embraces pretty much the whole of the country bordering on the coast from New York city southward to Washington, and extending to a greater or less distance inland. But the Commission would recommend that, until a more thorough examination can be made, and a complete isolation of infected herds be secured, every possible means that can be legitimately resorted to should be brought to bear to discourage and prohibit traffic in cattle from anywhere near the infected regions.

An Illuminated Buoy.

For some weeks the Pintsch Lighting Company has maintained a lighted buoy off Sandy Hook. The buoy is hollow, five feet in diameter at the water line, and is filled with compressed gas, enough, it is said, to supply for thirty-five days a light which is visible six or seven miles. The "Pintsch" gas used is made from fat, paraffine refuse, shale oil, grease, or any similar substance. It is compressed in retorts, and is carried out to the buoy when needed. The owners assert that this gas is far safer than coal gas, is one-third cheaper, and can be compressed in a far smaller space than coal gas. A patent regulator, devised to insure a steady flame whether the pressure in the buoy is high or not, consists of a cast iron conical vessel, about twelve inches in diameter and six inches high, the upper part of which is closed by a gas-tight membrane, to the center of which is fastened a rod with a movable joint, and this again is connected with a lever attached to a special valve, which opens to a greater or less extent according to the pressure on the membrane, and the light remains clear and steady notwithstanding the tossing caused by heavy seas. A device for lighting the gas of such a buoy by electricity was patented by the company; but the cost of the gas is so small that it was deemed best to use as little machinery as possible, and this device was given up. The refilling of the buoy at certain intervals is done by a tender. Gas from the tender's tank at a pressure of ten atmospheres is allowed to fill the buoy to a pressure of six atmospheres by means of a rubber tube. The buoy is built without rivets, the body forming a compact wrought iron vessel.

The company claim that such buoys have been tried satisfactorily in England, Russia, and Germany, the cost of the light being only ten or twelve cents a day.

The electric buoy that was put at Sandy Hook last summer drifted away and was picked up at sea by a Dutch vessel and carried to Antwerp.

A Fish Hawk's Nest in a Channel Buoy.

The iron spindles which work the reefs in Long Island Sound are made with globular heads or basket shaped tops so as to be clearly seen. The spindle that warns vessels of the location of the end of Groton Long Point Reef, near Watch Hill, has a top shaped like a grocer's bushel basket. Some years ago a pair of fish hawks carried cornstalks and straw enough to this spindle to nearly fill the basket, and adopted it as their home. The same birds, apparently, have continued to occupy the spot, and the female has just hatched out a new brood. It is seen circling about the nest at the approach of nearly every vessel. The winter storms usually shatter the nest, but the birds repair the damage every spring.

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TIN-PLATING PROCESSES.

Perhaps the best and cheapest substitute for silver as a white coating for table ware, culinary vessels, and the innumerable articles of manufacture requiring such a coating is pure tin. It does not compare favorably with silver in point of hardness or wearing qualities, but it costs very much less than silver, is readily applied, and easily kept clean and bright.

There are several methods in use by which small articles —wire, etc.—of iron, copper, brass, zinc, and composition are tin plated. These are:

1. By contact with melted tin.
2. By tin amalgam.
3. By simple immersion.
4. By battery.

The contact process is that by which all sheet tin, or, more properly, tinned sheet iron, is produced. A description of this process as applied to tin plate will be found on page 68 current volume.

In tinning hollow ware on the inside the metal is first thoroughly cleansed by pickling it in dilute sulphuric (or muriatic) acid, and scouring it with fine sand. It is then heated over a fire to about the melting point of tin, sprinkled with powdered rosin, and partly filled with melted pure grain tin covered with rosin to prevent its oxidation. The vessel is then quickly turned and rolled about in every direction so as to bring every part of the surface in contact with the molten metal.

The greater part of the tin is then thrown out, and the surface rubbed over with a brush of tow to equalize the coating. The operation is repeated, if necessary. The vessels usually tinned in this manner are of copper and brass, but with a little care in cleansing and manipulating iron can also be satisfactorily tinned in this manner.

The vessels must be hot enough to keep the tin contained in them fused.

The amalgam process is not used so much as it was formerly. It consists in applying to the clean and dry metallic surface a film of a pasty amalgam of tin with mercury, and then exposing the surface to heat, which volatilizes the latter, leaving the tin adhering to the metal.

The immersion process is best adapted to coating articles of brass or copper. When immersed in a hot solution of tin properly prepared the metal is precipitated upon their surfaces. One of the best solutions for this purpose is the following:

Ammonia alum	17¼ ounces.
Boiling water	12½ pounds.
Protochloride of tin	1 ounce.

The articles to be tinned, first thoroughly cleansed, are put into the hot solution until properly whitened.

A better coating can be obtained by using the following bath, and placing the pieces in contact with a strip of clean zinc, also immersed:

Bitartrate of potassa	14 ounces.
Water (soft)	24 "
Protochloride of tin	1 ounce.

It should be boiled for a few minutes before using.

The following is one of the best solutions for plating with tin by the battery process:

Potassium pyrophosphate	12 ounces.
Protochloride of tin	4½ "
Water	20 "

The anode or feeding plate used in this bath consists of pure Banca tin. This plate is joined to the positive (copper or carbon) pole of the battery, while the work is suspended from a wire connected with the negative (zinc) pole. A moderately strong battery is required, and the work is finished by scratch-brushing.

In Weigler's process a bath is prepared by passing washed chlorine gas into a concentrated aqueous solution of stannous chloride to saturation, and expelling excess of gas by warming the solution, which is then diluted with about ten volumes of water and filtered, if necessary. The articles to be plated are pickled in dilute sulphuric acid, and polished with fine sand and scratch-brush, rinsed in water, loosely armed with zinc wire or *tape*, and immersed in the bath for ten or fifteen minutes at ordinary temperatures. The coating is finished with the scratch brush and whiting.

By this process iron—cast or wrought—steel, copper, brass, and lead can be tinned without a separate battery. The only disadvantage of the process is that the bath soon becomes clogged up with zinc chloride, and the tin salt must be frequently renewed.

In Hern's process a bath composed of—

Tartaric acid	2 ounces,
Water	100 "
Soda	3 "
Protochloride of tin	3 "

is employed instead of the above. It requires a somewhat longer exposure to properly tin articles in this than in Weigler's bath. Either of these baths may be used with a separate battery.

German Petroleum Springs.

The German people are excited over the alleged discovery of petroleum springs near Hanover, but the Berlin correspondent of the London *Times*, who announces the discovery, remarks that it will be wise not to overrate their value, as they may prove to be unimportant. It is, however, natural for the Germans to be hopeful of being able to produce their own oil, and possibly some for export in lieu of importing, as they now do nearly 68,000,000 gallons of crude and refined petroleum. chiefly from the United States.

ARTIFICIAL INDIGO IN MEISTER, LUCIUS & BRUNING'S EXHIBITION OF DYESTUFFS.

The new dyestuffs exhibited by this firm at the recent General German Patent and Design Exhibition may be divided into three groups: artificial indigo, naphthaline dyes, and chloraniline dyes. The first of these excites, for the moment, the greatest interest, because the discovery of the synthesis of the king of dyes is the most recent discovery in the coal tar industry, and is undoubtedly the most brilliant one since the discovery of artificial alizarine. The name of its discoverer, Prof. Bäyer, which was already widely known before this, his greatest achievement, has now passed beyond the limits of his professional circle.

At the present day, discoveries in the chemistry of dyes are founded upon calculations sustained by a knowledge of chemical facts and laws. The success of experiments based upon these calculations proves or disproves their correctness. When the results are unfavorable, it is a proof of the flaws that still exist in chemical theories, in spite of their present complete development.

The synthesis of indigo could only be accomplished after an accurate knowledge of its constitution had been acquired. Many chemists have been employed in its study, but Bäyer completed it. In the German patent granted him March 19, 1880, he designated the constitution of indigo in these words: "There is a certain arrangement of atoms which is peculiar to indigo and its color derivatives, and which is built up from one molecule of benzol containing a side-chain of two carbon atoms, and on this latter a nitrogen atom in the ortho position."

In his attempts to find out simple bodies whose transformation products furnished similar arrangement of atoms, he found that certain derivatives of cinnamic acid on proper treatment with chemical reagents were able to produce the desired bodies. Formerly cinnamic acid could only be made from certain resins such as storax, tolu, and Peru balsams. Of course a technical use of this costly material for the production of so cheap a dye as indigo could never have been thought of, but cinnamic acid had already been made synthetically by the action of acetyl chloride upon benzaldehyde, and more cheaply by treating benzol chloride with acetate of soda. This chloride of benzol, and the aldehyde obtained from it, are made from toluol, a hydrocarbon very abundant in coal tar. Since Bäyer's discovery experiments have been undertaken on a large scale to make indigo from cinnamic acid derivatives. The most important of these, and the only one now under consideration, is the orthonitrophenylpropiolic acid. In a dry state this is a yellowish white powder, and when treated with alkaline reducing agents furnishes indigo directly.

Nitrophenylpropiolic acid is best prepared as follows:

1. Cinnamic acid is nitrified with nitric acid. This produces a mixture of the ortho, meta, and para acids.

2. To separate these three acids from each other and isolate the only one that is used for making indigo, the ortho acid, they are converted into the methylic ether. This is accomplished in the usual manner with the aid of hydrochloric acid and wood spirits. The separation is effected by fractional crystallization of the ethers. The most abundant companion of the ortho acid is the para acid, and a patent has been granted for its use in the manufacture of a beautiful red dye.

3. The methylic ether of this orthonitrocinnamic acid is next saponified, *i. e.*, treated with dilute soda lye, and thus converted into methylic alcohol and the soda salt of the acid, and from this latter the acid is set free by means of another acid, and then dried.

4. By treating this with liquid or gaseous bromine, as long as it will absorb any, it is converted into dibromo-orthonitrocinnamic acid.

5. By treatment with alkali the bromine is abstracted along with hydrogen to form hydrobromic acid. The cinnamic acid, deprived of two atoms of hydrogen, is thereby converted into a new substance, the orthonitrophenylpropiolic acid.

Of course it is necessary to recover as far as possible the expensive materials, the bromine and methylic alcohol, used in its preparation. The complicate process requires a considerable outlay for apparatus and labor. The essential factor that governs the price of the manufactured material is, of course, the yield of dye. This depends, in the first place, upon the purity of the materials used; then next upon the various processes working smoothly, and in this case, too, it depends upon whether a body is to be produced that corresponds exactly with natural indigo, or one that is homologous with it, or some substitution dyestuff.

These near relatives of indigo may, in all probability, possess the same or nearly the same properties as the true indigo, so that it is supposable that the production of one or other of the many bodies theoretically possible offers greater chances for its cheap production than does now the manufacture of orthonitrophenylpropiolic acid, which yields true indigo.

To explain the difficulties that attend the cheap production of this body, we need only recall a few facts, namely, how difficult it is to employ pure material on a manufacturing scale, that chemical reactions rarely run smoothly, but are generally accompanied by secondary reactions, and that it is one of the most difficult problems of scientific and practical dye making to produce that isomere in largest quantity which is needed. So in the above process the toluol employed in making the cinnamic acid contains the higher homologues xylol and cumol; in nitrating and bromiding substitution products are formed instead of addition products, etc. All these undesirable accidents necessitate expensive purifications, which stand in the way of smooth manufacture.

The expense of making artificial indigo might have proved an insuperable objection if one lucky circumstance had not come to the aid of this industry. Heretofore the cotton printers were only able to use indigo in topical printing for dark shades at a very considerable expense, which was greatly out of proportion to the price of natural indigo, and at the same time he had great difficulties to overcome in this operation. Only a few calico printers knew how to do this, while most of them were compelled to dye the goods in the indigo vat, and then bite out the spots which were to be printed in some other color.

Any preparation suitable for printing on the goods and capable of producing equally fast colors would be very welcome to the calico printer, even if it was much more expensive than natural indigo. The orthonitrophenylpropiolic acid seems to fulfill all these conditions. It comes into the market as a 25 per cent paste, which can be used to produce indigo directly upon the fiber. It differs from reduced indigo—indigo white—in this respect, that it forms the dye by reduction, losing an atom of oxygen, while the other is converted into indigo blue again by absorption of oxygen. It is very easy to produce the deepest shades in printing with this new product, either by mixing the printing material with a suitable reducing agent, or, what is preferable, first impregnating the cotton with a reducing agent and then printing upon it.

The color is developed in twelve to twenty-four hours spontaneously in the cold. The reducing agents employed at first were grape and milk sugar, now potassic xanthogenate is employed. The reducing agents act only in alkaline solution, but the weaker the alkali the finer the colors; hence alkaline salts, like borax, are preferable.

The disadvantage of mixing the reducing agent with the printing material is that the color is developed too rapidly, and the advantages of a dye formed *in* the fiber is lost, while finished dyes cannot be fixed without albumen.

The reducing agents in use previous to xanthogenate of potash had the disadvantage that heat was necessary in developing the color. Then, too, it was difficult to ascertain the correct time and temperature, for if either was exceeded at all the color suffered and might even be destroyed.

One disadvantage of the new product which has not yet been overcome is that the color cannot be developed by superheated steam, and hence it cannot be used along with other steam colors. It is to be hoped that this will be overcome in time by suitable reducing agents.

As remarked, indigo can be readily prepared from orthonitropropiolic acid; this can easily be converted into indigocarmine in the usual manner. It acts just like natural indigo, but the color is handsomer than the best Bengal indigo. We have said already that the production of indigo is not yet to be thought of. But since the calico industry is able to pay a price for the new product which is proportional to the cost of its manufacture, there is abundant opportunity to collect experiences of all sorts in its manufacture, to improve the methods, and also discover new ways of reaching the desired goal. The progress already made in this domain justifies the most brilliant expectations.

Grain Harvests of 1881.

A summary of the reports on the harvests of the world in the annual volume of M. Estienne, just issued, shows that the wheat crop in France is better than last year's. This year's barley is not so good as in 1880, but it is fairly good. The maize crop is ordinary. Oats and rye are fair. On the whole the crops are not up to those of last year, but wheat is not much below the average. None of the crops will be very bad, but none will be very good. The crops in Great Britain are described as follows: Wheat is ten per cent below the average, and likely to realize only 10,000,000 quarters. Barley is ten per cent above the average, and oats are twenty per cent below the average. The year is one in which farmers are not likely to recoup themselves for losses during the past five years. In Austria and Hungary the crops are good all round. Wheat and barley are both above the average. Rye is very much and oats are slightly under the average. The reports from Italy agree that the crops are of medium quality and much below the abundance of those of 1880. In the Turkish provinces on the Danube the wheat harvest will be medium. Rye is good and abundant. Barley is good as regards quantity, but bad in quality. Oats are very much above the average. All the reports from Russia agree that the barley is the best crop of the year, doubling that of 1880 in quantity, but not so plump and weighty. Rye is abundant. Wheat is good.

Throughout Germany winter and spring sowings are in marked contrast, the former yielding good and the latter very defective crops. Oats are very good. Barley is thin. None of the crops are of the average. In the Prussian States the crops are fair. The Swiss wheat crop is very poor in quantity owing to drought, but in quality it is very fine.

Oats and barley are good in quantity and quality, but there is a small area sown of the latter. Belgian wheat is far below the average. Barley is good; rye and oats are fair. All crops in Spain are bad. All cereals in Holland are in good condition. All reports from the United States agree that the yield will be under the average.

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IMPROVED ELECTRIC GENERATOR.

A great deal of attention is now given to the relief and cure of diseases without the use of drugs, and electricity is being recognized as one of the important healing agents for accomplishing this very desirable end. Hitherto it has generally been considered the prerogative of a physician to properly apply the electric current to curative purposes; but since it has been discovered that a mild continuous current is effective in the treatment of diseases, it is apparent that any one having the necessary appliances may use the electric current to advantage.

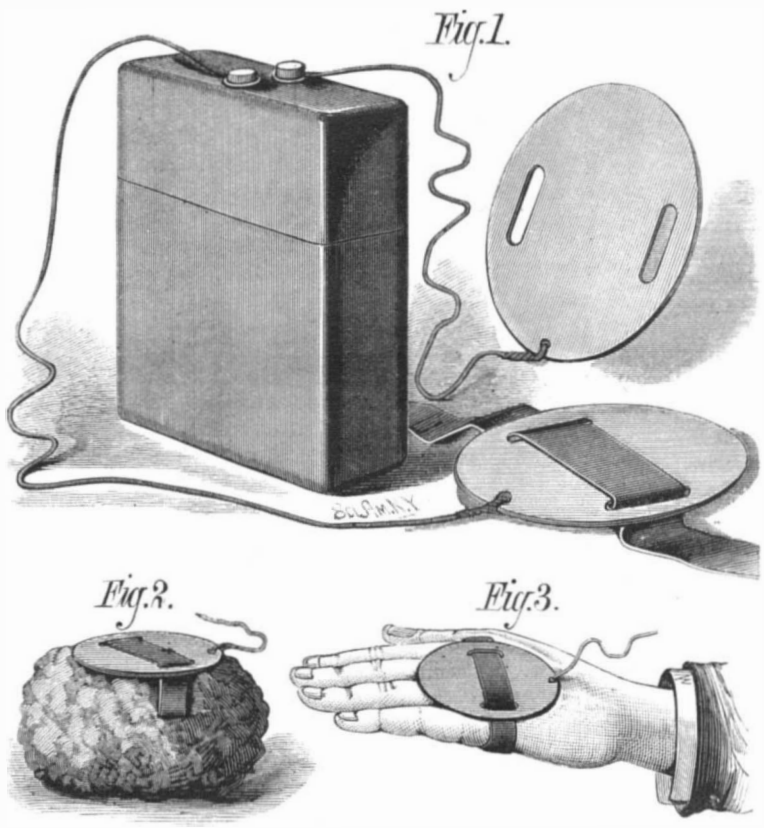
The engraving represents a very simple and compact generator or battery for creating a continuous electric current for curative purposes. It is a modification of the well known Trouvé blotting paper battery, and is capable of yielding a constant current for a long time.

The inventors of this generator and its accessories state that they have had batteries of this class in use yielding a current for over a year without attention, and it may be renewed at the end of that time without trouble or expense.

The rubber case contains two plates, one of zinc, the other of copper, each connected with a clamping screw extending through the cover. Flexible cords connect the binding posts with the electrodes, the latter consisting of two nickel plated disks, each having two slots for receiving a strap by which the electrode may be bound upon the affected part. The generator is carried in a pocket in the inside of one of the garments. This may be done with perfect safety, as the exciting fluid with which the generator is charged is entirely absorbed by the porous filling placed between the zinc and copper plates.

The electrodes are often worn on a belt, one being placed in front of the body, the other at the back. Fig. 2 shows the method of attaching one of the electrodes to a sponge for bathing purposes, and Fig. 3 shows its application to the hand when the current is employed to supplement frictional treatment.

There are a number of other methods of applying the current, which need not be described in detail here. Further information in regard to this invention may be obtained by addressing the Constant Current Cure Company, 207 Main street, Buffalo, N. Y.



CONSTANT CURRENT ELECTRIC GENERATOR.

IMPROVED FREIGHT CAR.

The engraving represents an improvement in freight cars lately patented by Mr. Francis Klier, of Cairo, Ill. The car is so constructed and arranged that it can be readily converted from a box freight car into a bottom discharging grain car. The great advantage secured by this arrangement is that the car may always be used in one way or the other, and when in use as a grain car it may be much more rapidly unloaded than the ordinary car, thus preventing the frequent blockades that arise from the slow discharge of enormous quantities of bulk grain transported by the roads.

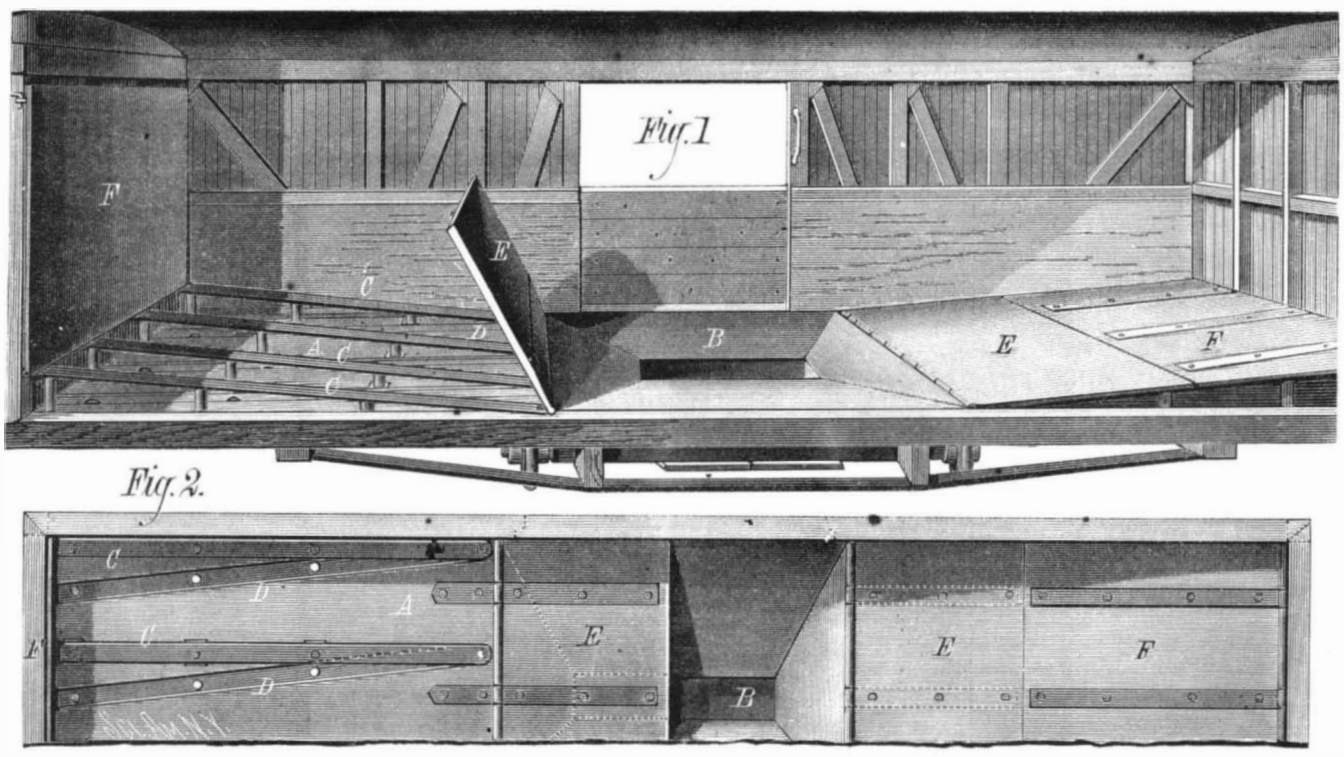
The invention is very simple for one that accomplishes so much.

Fig. 1 in the engraving is a side elevation of the improved car, with the side of the car removed to show the internal construction. Fig. 2 is a partial plan view showing one half of the car arranged as for carrying ordinary freight, with the other half arranged as for carrying grain.

In the engraving, A represents the solid level floor of the car, depressed at its central section by removal of the floor at that point about the central opening, B. The end sections of the floor have several longitudinal parallel grooves, D, formed in them for the reception of the bars, C, which are of iron, and pivoted at one end on the borders of the middle or hopper section when the car is to be used for ordinary freight, and through these grooves and floor of the car holes are made for the reception of the supports of the bars, C, so that the said bars can, when desired, be arranged flush with the surface of the floor, A.

The false floor is constructed in two end sections, F, and two central sections, E, the former being hinged by long strap hinges to the opposite ends of the car, about twelve inches above the floor, and being of sufficient size to reach entirely across the car and half way to the central section of the fixed floor, while the central sections, E, of the false floor are hinged to the floor, A, along the edges of the hopper, and meet in the center of the car over the central opening, B, and form a portion of the ordinary freight car floor, or turn up to meet and abut against the sections, F, when they are turned down and form a portion of the sloping grain car floor.

When arranging the car for carrying the grain the bars, C, are raised from their grooves and moved laterally, and adjusted with their supports resting in socketed plates attached to the floor; the sections, F, of the false floor are then let down upon the bars, C, and the sections, E, are raised and turned back on the bars, C, forming a floor sloping from each end toward the center of the car. This floor is covered with zinc or sheet iron, so that the grain may readily slide upon it, and all the joints about the floor are made tight The grain door is then set in place in the cast iron door sill and door jambs, and held down by iron pins or other suitable fastenings. When ready to unload the car load of grain, one man will open the outlet, B, by turning the wheels and screws below the car floor, thereby moving the slides which close the opening, apart, and the grain will then shoot through the outlet, B, into the conveyor beneath the track or into other suitable receptacle, unloading the car in less time than it would take four or five men to get into a car and begin to work at unloading in the usual manner.



KLIER'S FREIGHT CAR.

MECHANICAL INVENTIONS.

An improved car coupler, patented by Mr. Stephen Farnham, of Forest Home, Texas, consists in a transversely arranged bar supported by suitable hangers secured to the end of the car a suitable distance above the draw bar, each end of the transverse bar being provided with hand wheels having a notch on their outer periphery, with which engage weighted pawls suitably pivoted to the side of the car; also in an arm extending from the transverse bar for supporting the link, provided with a spring arranged to exert pressure thereon, and thus assist in holding the pin down in place.

Mr. Thomas Bradley, of New York city, has patented an improved machine for sweeping streets, gathering the sweepings, and delivering the material gathered to carts at one operation. The object of this invention is to save the use of horses and men, especially for the sweeping machine, by furnishing a machine adapted for attachment behind the carts used to convey away the sweepings, so that the sweeper can be attached, drawn along, and, when the cart is filled, the machine disconnected and left for the next cart.

Mr. James McKinney, of Saltillo, Miss., has patented a portable machine for sawing off the mashed and burred ends of railroad rails, instead of chipping them off with a hammer and chisel, as heretofore. The invention consists in a novel arrangement of a frame for attachment to the rail, and a frame suspended therefrom and carrying a rail saw and devices for operating it.

An improved road engine has been patented by Mr. Abraham O. Frick, of Waynesborough, Pa. The principal features of improvement consist in the structure of the framework and means for hanging the boiler therein to compensate for expansion; in the means for connecting the engine and the frame so as to avoid working strain on the boiler sheets; in the construction and arrangement of the front truck, and in the means for guiding the engine.

An improved machine for making rims for metal vessels has been patented by Mr. William W. Jones, of Nashville, Tenn. This invention relates to a machine for forming rims for the covers of sheet metal vessels, which rim is in the nature of a hoop or band of metal having on one of its edges an out-turned flange.

Mr. Abraham O. Frick, of Waynesborough, Pa., has patented an improvement in steering gear or road engines, which consists in combining the pivoted front axle and the positively-acting steering gear shaft by a connection which makes the strain of the steering gear on the axle an elastic one, and whereby, also, in the event of one of the wheels striking a stone or obstruction, the shock is taken up and not allowed to injuriously affect the steering gear, and the axle is immediately restored to its former true position for running in a straight line after it passes the obstruction.

An improved axle skein has been patented by Mr. Isaac E. Ricketts, of Garnett, Kansas. The object of this invention is to provide a device whereby the friction of the wheel hub on the axle thimble is greatly reduced, so that the wheel will run in an easier manner and the thimble will endure much longer.

Mr. John S. Whitney, of Lowell, Mass., has patented an automatic oiler for heavy fast running bearings, whereby all waste of oil and the entrance of dust and dirt upon the bearings are prevented.

An improved ore concentrator has been patented by Mr. Robert Parry, of Alpine, Col. The invention consists in diaphragm moving bars combined with adjustable tops, whereby the motions of the diaphragms may be increased or diminished.

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Mr. Nathaniel Dunn, of New York city, has patented an automatic tension, more particularly intended for lock-stitch machines, but adaptable to single thread machines, which may be readily attached to existing machines, and be operated by the action of the needle bar in such manner as to positively clamp and release the thread at proper points in the stroke of the needle, so as to insure a stitch of proper tightness on any kind of work, either thick or thin, without any special adjustment.

An improved wood grinding machine for paper pulp has been patented by Mr. Benjamin F. Perkins, of Bristol, N. H. The improvements relate to the class of wood grinding machine using revolving stones, to which the wood is pressed by feeding devices. The inventor makes use of a bevel edge stone set horizontally with the smaller side downward, combined with feed mechanism at opposite sides, so that in operation the step of the stone spindle is relieved from undue pressure, the pulp leaving the stone readily, and at the same time the weight of the stone is utilized to aid the grinding.

An improved recording mechanism for spirit meters has been patented by Mr. Julius Leede, of Washington, D. C. The object of this invention is to furnish an improved automatic apparatus or machine for accurately measuring and recording the quantity, specific gravity, and temperature of distilled spirits or other liquids passed through it. These functions are performed simultaneously, and the three records—to wit, of quantity (in gallons) and temperature and specific gravity (in degrees)—are made ineffaceably on the same traveling paper sheet or strip by means of puncturing needles or styluses. The sheet, which is practically continuous, is suitably marked and graduated for the purpose, and is drawn off automatically from a roll, and the recording or puncturing devices are operated by mechanism connected with a vibrating lever attached to floats that rise and fall alternately in separate cylinders, and constitute the primary elements of the meter.

OPERCULUMS AND EYESTONES.

BY A. W. ROBERTS.

Nearly all univalve shells have an operculum, or door, that fits closely to the inside of the mouth or opening of the shell. This door is generally situated on the upper side of the back-part of the foot on which the animal moves. [See article on the Pyrula, or Winkle Shell, SCIENTIFIC AMERICAN, No. 11, Vol. 44.]

When the univalve draws in his body the operculum is the last part that is taken into the cavity or mouth of the shell, where it fits so accurately, and is of such a horny or calcareous nature, that it affords perfect protection to the animal against enemies from without.

Fig. 1 represents the under side, or that part of an operculum which is attached to the body of the animal. Fig. 2 illustrates the side, which is presented, when the animal has withdrawn into its shell, as a shield or barrier against the sharp teeth of fish. This operculum is an exact representation or duplication of an eyestone on a very large scale. In fact, all eyestones are operculums or small close-fitting doors that are used by the eyestone bearing univalves to protect them from intruders.

Fig. 3 is one of the most common of our eyestone bearing turbos, which, in the engraving, is shown natural size. A is the under side of the eyestone, which is composed of numerous slightly concentric grooves. When moving over the eyeball, the grooves collect and retain all foreign substances. The movement of the eyestone is caused by the pressure of the eyeball against the stone. The arrow, at B, indicates the mouth or opening wherein the operculum or eyestone is situated when in its natural position.

Eyestones are composed of calcareous material, and when placed in a smooth plate containing a weak solution of lime juice or vinegar, are slowly moved about by the evolution of carbonic acid gas. It is from this fact that ignorant people imagine that the eyestone has life, and a particular weakness for vinegar, in which above all other fluids it delights to swim.

Most of the eyestones sold to the wholesale drug dealers of New York city are supplied to them by sailors employed on vessels engaged in the fruit trade of Venezuela and other South American Republics. They are regarded with great mystery and awe by the native inhabitants, by whom they are collected in large quantities.

A very prevalent error exists as to the origin of the eyestone. Many persons imagine, and many works on the subject state, that the eyestone is the product of the fresh water lobster or crayfish, and that the stones are found in the stomach of the above-named animal, and constitute a storage of lime during the moulting season. This is not so. The stones found in the crayfish are known as crabstones. In Poland, Russia, Astrachan, the crayfish are rotted in deep pits dug in the earth, after which the refuse is washed to obtain the crabstones, which are used in many parts of Europe to correct stomachic difficulties.

Fig. 4 is one of the most beautiful operculums known. In fact its coloring is so brilliant and gemlike and the blending so exquisite that it is being used extensively by

Fig. 1.—Under Side of Operculum.

our leading jewelers, and always commands a high price for the most brilliantly colored specimens.

Fig. 2.—Top Side of Operculum.

Fig. 5 is the operculum of the *Natica heros*, one of the most common of the larger varieties of shells to be met with on the Coney Island sands. This operculum is composed of

Fig. 3.—The Eye Stone sold by Druggists. (Nat. size.)

Fig. 4.—Gemlike Operculum used for Jewelry.

a horny and translucent material, which, when exposed to a flame, burns like horn and gives off the same odor.

Fig. 5.—Operculum of *Natica heros*.

These curious and puzzling hornlike objects are always to be met with on the shores of Long Island at low tide.

PECULIARITIES OF THE CEPHALOPODA.

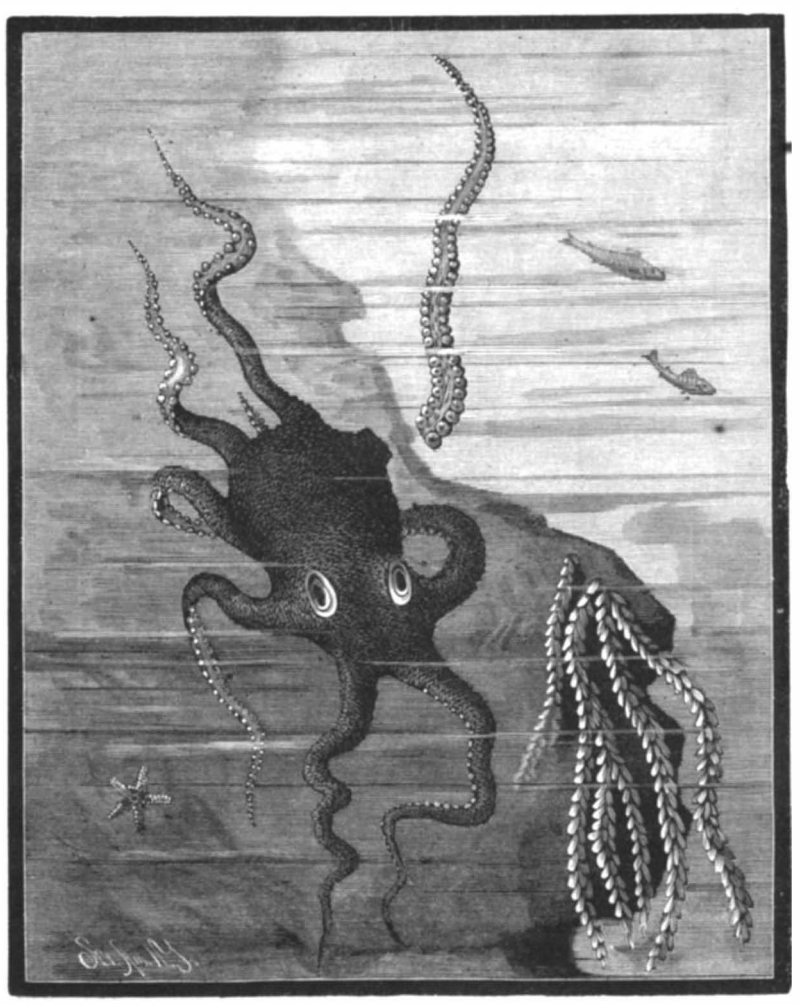
BY C. F. HOLDER.

Among the mollusks of the highest class the cephalopods have many remarkable features well worthy the close attention of the student. They are divided into two general classes by naturalists, according to their number of gills. The common octopus, and in fact all the cephalopods except the nautilus, belong to the two-gilled or dibranchiata, while the nautilus forms the only living representative of the tetrabranchiata; other divisions are based upon their number of legs—hence the octopoda, with their eight arms, and the decapods (as the squids), with ten. The most striking feature in the anatomy of these animals is the brain, which is covered by a decided and distinct cartilaginous covering or cranial envelope that closely resembles the skull of the vertebrates. Furthermore, the head is distinct, and in the squids movable; the eyes large, bright, and, so to speak, intelligent; in fact, their entire composition bespeaks for them a high position in the scale of life.

The octopods, with the bag-like bodies, green eyes, and branching arms lined with suckers, are far from pleasant objects. Each arm is lined with two rows of round suckers that act like so many air pumps and hold on to any foreign substance with death like tenacity; besides these weapons the octopus possesses an ink bag and two parrot-shaped bills of great power. They rarely swim, except one or two species that have peculiar webs for this purpose between the arms, and generally are found hidden among the dead coral of the reef or under the refuse of the bottom Their power of attenuation is remarkable, and I have often observed them draw their entire body through an orifice that seemed scarcely large enough to admit a single tentacle. When touched, rich waves of color follow each other over the body in rapid succession, and they assume a mottled appearance. Another attack will cause the sharp eyes to glow with a baneful light, and, like a flash, a dark cloud permeates the water, and under its protection the animal makes off. Their strength is surprising. I have frequently struck them with a spear a foot and a half across, and having lifted them into the boat found it almost impossible to tear their arms from the boards after they had taken hold. The strength of one sixteen feet across can well be imagined. A story comes from the northwestern coast, which has been substantiated, to the effect that a monster octopus had seized an Indian woman while bathing, and several hours after the body was discovered in deep water in the arms of the monster.

Some interesting experiments made by the writer with these animals, on the Florida Reef, seem to show that they at times use their color as a protection. Ten or a dozen specimens were taken and placed in inclosures in a shallow portion of the open reef. In one the bottom was of pure white coraline sand; another was merely an inclosed head of *Meandrina cerebro* forms, which was a brownish olive, while the third had a bottom almost black. Into these inclosures the animals were released, and the next day examination showed that they had very decidedly assumed a hue in conformity with that of the bottom upon which they rested; those on the white sand were the palest gray; those on the living coral had assumed a darker hue than usual; while those on the black bottom could hardly be distinguished. Many other animals also adopt similar methods for protection.

The octopods are oviparous, and deposit their eggs in clusters that resemble bunches of fruit, often called sea grapes by seamen. They are always deposited upon some solid substance, as shown in the accompanying illustration, hanging to a rock.



THE OCTOPUS.

The most remarkable peculiarity concerning them is the formation of the male, who is entirely different from the female in every respect. What is generally called the male is represented in the engraving as a common octopus, but in reality he is but the parent of the real male that appears by a process of fissuration. This curious freak of nature can better be understood by observing the animal at different stages. When the breeding season arrives, the third left hand tentacle or arm of the so-called male octopus assumes a different shape. On one, the *Octopus bairdii*, it appears as a short rounded arm, as if torn off and the wound healed up and swollen; the change increases until, finally, the arm is detached, and becomes itself a living organism, and swims freely in the water, being either deposited by its originator in the funnel of the female or finds its way there instinctively. When first discovered it was considered a parasitic worm, and so described and named *Hectocotyl*, but later investigations have shown its true nature. Cuvier describes the hectocotyl of *Octopus granulates* as five inches in length and resembling a detached arm of the octopus, its under surface being bordered with forty or fifty pairs of alternate suckers. Dr. Kolliker, of Messina, describes another, the hectocotyl of *Tremoctopus*, which was adhering to the interior of the gill chamber and funnel of the *Poulpe*. The body is worm-like, with two rows of suckers on the ventral surface, and an oval appendage on the posterior end. The anterior part of the back is fringed with a double series of branchial filaments (two hundred and fifty on each side). The suckers, forty on each side,

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closely resemble those of the tremoctopus in miniature. Between the suckers are four or five series of pores, the openings of minute canals, passing into the abdominal cavity. The mouth is at the anterior extremity, and is minute and simple. The alimentary canal runs straight through the body, nearly filling it. The heart is in the middle of the back, between the branchiæ. It consists of an auricle and a ventricle, and gives origin to two large vessels. There is also an artery and vein on each side, giving branches to the branchial filaments. Nerves extend along the intestine, with one ganglion. The oval sac alluded to above incloses a small but very long convoluted tube, ending in a muscular *vas deferens* containing innumerable spermatozoa.

The hectocotyl of the argonaut was considered a parasitic worm, described under the name *Tricocephalus*. It is similar to the others.

This strange method of propagation is not found among the squids; with them the male and female are alike, except a slight difference in size. The last ten years has set at rest the question as to the size of some of these animals, and from well-preserved specimens they are known to grow to a length of sixty or seventy feet. In the natural history of almost every country there are legends of the existence of these huge creatures, but it is only within a few years that perfect specimens have been found. Whalers often found immense pieces of squid in the stomachs of whales, and finally scientists made some decided efforts to obtain one of these gigantic animals. Rev. Dr. Harvey, of Newfoundland, was the fortunate finder, and in a short time a number of them were secured.

The one bought by the New York Aquarium was by far the best, and Prof. Verrill, of Yale, and Dr. Holder, of the American Museum, were fortunate in examining it and taking its measurements. It was afterwards ruined by being kept out of alcohol, and shrank to nearly half its original length, which was nearly forty feet. The body resembles a great gray bag, and the tail an arrow head; from the head the eight short arms branch out and the two long ones. These latter enlarge at the tips, and only these have suckers, while the short tentacles have suckers their entire length. Each of these disks contains a hard bony marginal rim, sharply serrated, that when pressed upon the flesh can be pressed into it by the piston-like arrangement of the sucker. The effect of thousands of these can readily be imagined. A peculiar arrangement is noticed on the end of the long sucker; between the rows of suckers, many of which are on stalks or pedicles, are hard callous cushions; their use is seen in the movements of the animal as it secures its prey. They move slowly through the water, and sighting their victim with their large saucer-like eyes, instead of rushing at it, the two long arms are thrown out thirty feet or more and clasp it; the use of the cushions is now seen, as the suckers of one arm clasp the cushions of the other, and *vice versa*, and thus double power is brought to bear. The act can be better illustrated by tying the hands at the wrists, and the use of them in this position is analogous to the movements of the squid. Once caught in these long handled pincers, the fish is drawn within reach of the eight short arms, which wind around it like so many snakes, lacerating its body, and finally press the back of its head against the parrot-like beaks, which penetrate the flesh and sever the spinal cord. This method of severing the spinal cord is very general among the squids, and all the fishes that have been noticed that have been cut by them have been cut in exactly the same spot, and the most effective one, as its struggles are instantly stopped.

The power of the animal is very great. A fisherman in Newfoundland saw one lying evidently dead on the surface, and struck it with an oar and came near being a victim. The squid, which was the *Architeuthis princeps*, ejected a column of ink and water from its funnel, and threw its arms over the boat, almost sinking it. One of the tentacles caught the man by the arm, lacerating the flesh terribly; he seized an ax, however, and succeeded in severing several of them, finally sending an oar blade into the eyes and destroying the animal.

A use of the long arms has been noticed when one was thrown upon the shore in a gale of wind, and although in a heavy sea, it fastened the long suckers to the rocks and outrode the gale, swinging to them as would a ship by a hawser.

The squids are undoubtedly denizens of the deep sea, which accounts for their rarity. In the later geological ages they reigned supreme among their kind, and their curious hardened ink bags are found and still used as ink.

The shelled cephalopods grew to enormous dimensions. The ammonite is found almost as large as a cart wheel; the othocerotite, a straight chambered cephalopod, has been found fifteen feet long, and according to some geologists they occur in the Black River limestone, at a length of thirty feet. It would take a volume to even enumerate the wonders of this interesting family, whose history is written indelibly on the rocks of the primeval world.

A Large Collection of Spiders.

Captain Holden, of Cincinnati, Ohio, is credited with an exceptionally valuable collection of spiders, numbering nearly 25,000 specimens, and embracing 4,000 species. They are arranged in glass bottles, with labels giving name, collector, and locality. California furnished 5,000 specimens, and New England as many more. One species is represented by 108 specimens, from all parts of the United States, showing how much effect environment has in modifying form. The collection is supplemented by a full and complete catalogue of the literature of the subject, comprising about 70,000 references on 10,000 cards. This valuable contribution to the study of this little known branch of natural history he hopes to complete and publish at an early day.

Musk Rat Musk.

Mr. Fairthorne says, in the *American Journal of Pharmacy:* "The difficulty of obtaining pure musk, and the high price of the same, make it a desideratum to find a substitute for it for use in perfumery that possesses the advantages of strength and cheapness. We find these in an article by the above title, and offered for sale by numerous itinerant colored merchants, who come chiefly from New Jersey, where they obtain their supplies, and offer the musk pods generally at the moderate price of 10 or 15 cents a pair. If ten or twelve pairs are cut up with scissors into small pieces, and, with the addition of two drachms of slaked lime, allowed to macerate for a week or two in a pint of alcohol, a very fragrant tincture will be obtained, which will be found at least three times as strong as the tincture or extract of musk generally employed. I have used it for several years in making most delicate-flavored colognes, and found it to answer equally well as the musk generally employed. I do not know whether the musk from musk rats has ever been used as an internal remedy."

The musk rat, or musquash (from the Indian name, *muskwessu*), is frequently spoken of in connection with its powerful musky odor by the earlier writers on America. Thus, for instance, in "Virginia Richly Valued" (Hakluyt, 1609), we read: "If China suppose a merit of precedency in Muske, Virginia may justly oppose them with her Muske-Rat, or *Muscassus*, which in all probability cannot but be the same."

Basket Willows.

The subject of the periodical overflow of the Thames and other rivers, upon which a good deal of public notice has lately been bestowed, should be the means of directing more attention to the possible improvement of wet ground in marshy situations by the planting of *osiers*, which, under the technical name of "rods" and "willows," are a merchantable commodity, regularly in request by the basket-makers, which will yield a more certain return, perhaps, than many agricultural crops that are subject to casualties arising from adverse seasons, the profit being very considerable, and the management comparatively easy and simple.

Nature, indeed, spontaneously suggests this application; for the goat-willow, or sallow (*Salix caprea*), may often be found indigenous in moist ground, more particularly in those waste and marshy situations that are, under usual practice, so difficult to deal with. A two-year old seedling plant of the goat willow will often produce several shoots three or four feet high, and if allowed to grow longer still, and cut down every three or four years, no tree will produce so great a bulk of fagot wood, for a well established stock will sometimes give out in one year shoots eight to twelve feet long, straight and well proportioned, some of them an inch in diameter at a yard from the ground. Ultimately the goat-willow becomes a fine tree, often attaining a height of forty or fifty feet, with a trunk varying from one and a half to two feet in diameter, and for hoops, poles, rods, crates, sheep-fences, and other purposes, the earlier produce of the goat-willow is extremely valuable.

But it is in the form of osiers regularly cropped, that can be grown upon land subject to tidal overflow, that a definite produce and consequent regular income can be relied on, and as there is a good deal of confusion existing as to the various species of *Salix*, we will briefly indicate them.

The green-leaved osier, or ornard (*Salix rubra*), is strong and tough, and in request for carboy baskets.

The Spaniard, or Spaniard rod (*Salix triandra*), has several varieties, some very good and others very inferior. The black-budded Spaniard is used for the bottoms, rims, and handles of large baskets. The gray Spaniard comes in useful for coarse brown baskets. The horse Spaniard is a very poor kind.

The old common osier, being soft, of course, and brittle, is not worth cultivating in many instances; but there are some varieties of the *Salix viminalis* that are extremely useful, and the good and inferior ones bear such a close resemblance to each other that the difference often cannot be detected except in the working. The best variety is known under several names, as those of the snake osier, brindled osier, blotched osier, and speckled osier. The yellow-barked osier is also a good one, while the long skin is of smaller growth, but has the good qualities of being heavy, firm, and tough. The brownrod, brownard, or silver osier (*Salix hoffmanniana*), has a whitish hue on the under side of the leaf, eel baskets being usually made of this variety. The gelsler partakes somewhat of the nature of the Spaniard, but is of more tapering habit, with a thick butt. The new kind (*Salix forbyana*) is also akin to the Spaniard, being equally strong, but more pliable in working. The Hollander resembles the new kind in its qualities, but is different in appearance, and these may be seen growing in large quantities on the Dutch coast. The stone osier is a good kind, used for fine work.

The blunt-leaved ornard (*Salix lambertiana*), the bastard French (*Salix lanceolata*), and the rose ornard (*Salix helix*) are very inferior, used only for fish baskets and hampers, their ends snapping in the working inward and outward, which consequently makes inferior work; but the bitter ornard (*Salix purpurea*) grows tough and slender, and, like all the other ornards, will grow in water.

The French, French rod, or real French has been imported from France, where it is much used in the manufacture of small ornamental baskets. On the Continent it is much in request by wine coopers, who bind on their wooden hoops to the wine casks with it.

The rods, or willows, as they are termed in the trade, comprise several varieties, as the skit willow, the goldstone, or hornrod, of which there are two subdivisions—the wire hornrod, which is thin and tough, and the water hornrod, which is very inferior. The rods (osiers, etc.) grow best on strong and loamy soils.

And here we should remark that soil exercises as material an influence upon the growth of osiers as upon other crops, requiring a compact sub-soil that retains moisture, and thus they will not answer in strong clayey soils, which in summer become hard and dry; for these crack, and the moisture of the land evaporates. The Spaniard, new kind, and French sometimes answer very well upon light land, where the subsoil is kept moist by land springs; but where the supply of moisture is imperfect, an osier plantation lasts a comparatively much shorter time, and requires renewing in a space of time varying from fifteen to twenty years; but in land the best adapted for their growth, by the margins of rivers subject to tidal overflow, they will last for fully seventy years with occasional mending; but on light land the osiers are smaller and shorter, and the crop less bulky than when grown upon strong loam.

Upon the first formation of an osier plantation the ground should be well trenched to the depth of a foot and a half, and in light soil the sets should be planted in rows eighteen inches apart and fifteen inches from each other in the row; for where the supply of moisture is not continuous, the shoots are fewer and shorter, and it is in such situations that the smaller varieties suited for the manufacture of small baskets are grown; and there is an advantage in thus planting them close, for if more space were allowed, instead of drawing each other up long and slender, they would branch out and grow crooked and "clubby" near the stools.

Upon the soils better adapted for their growth, which is rich and continuously moist, they are planted at wider intervals, for upon such they will reach a length of eight, ten, or a dozen feet, so that the rows should be placed two feet asunder, and the sets stand a foot and a half apart in the rows. If these were planted as close as the former the result would be that, there not being room enough for the number of shoots that the stronger plants will throw out, a few of the leading ones would get very tall, and their growth would prevent the action of light acting upon the others, which in consequence would become of inferior quality and not ripen their wood in the course of the season, which in this state would be soft and pithy, and consequently unfit for manufacturing purposes.

The action of light upon osiers is somewhat remarkable. In ordinary seasons they are of a yellowish brown, but they sometimes assume a dull green color. The willows in cloudy seasons are of a dull brown mahogany color, but in clear seasons the shoots grow of a bright red color.

The sets are cut from the lower part of the shoots, and are generally used about the thickness of one's little finger for the larger varieties. The small part of the rods would strike just as quickly, but they produce smaller shoots. The sets should be about sixteen inches long, and be inserted into the ground at about half their length.

In severe seasons some of the plants will die, the most injurious weather to an osier plantation being when mild winters are succeeded by hard frost in early spring. The plantations will then require *mending*, which is done in the following manner: The longest and smoothest rods are chosen, which are cut from their butt ends in a slanting direction, and are thrust into the ground by the side of the dead stool, to a depth of eight or nine inches. These are inserted as they have grown, without being shortened, for if this were done they would be smothered by the shoots of the older stools, and by being inserted of their full length, they have the benefit of air and light for a considerable time, which enables them to establish themselves before the others grow high enough to overtake them, when the summer will be considerably advanced.

Osiers may also be grown upon springy land that is sometimes met with near the bottoms of elevations, the slopes of which are kept moist by the drainage of higher lands; and although such springs might often be cut off and drained by means of a few deep drains, aided by auger holes driven down into the porous watery strata which form their reservoirs, by the method known as the Elkington system, after the name of the farmer who first practiced it, such drainage is very often left undone; and there are many waste spots upon which osiers could be profitably cultivated, which would prove a source of profit to owners or occupiers of land, that are frequently entirely neglected and overlooked.

Osiers can be cut any time between the fall of the leaf and the rising of the sap in the spring. And although they are often cut before and after this time, it is not good practice to do so, especially when cut late in the spring, as it weakens the succeeding crop.

According to the accounts which have been published, the osier grounds upon the estate of Holkham that are planted with *Salix viminalis* commence their profitable return the second year after their formation, the first crop averaging £34 17s. per acre, after which they are cut down yearly and realize about £27 10s. per acre; these figures furnishing a strong argument in favor of the plan now recommended for more general adoption.—*The Farmer.*

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The Great Bamboo of Japan.

In a paper recently read before the Horticultural Society of Victoria, Mr. F. C. Christy, describing a specimen of the Japanese gigantic bamboo, now growing in the society's gardens in Melbourne, says: "It is cultivated in groves on the hillside or valley, in deep volcanic chocolate soil—not in wet situations, but where there is a moderate amount of moisture. In early spring the bamboo throws up large offsets, or suckers, around the parent plant; these are about 3 in. or 4 in. diameter, and are removed when about 12 in. above the ground, leaving three or four to mature, which apparently mature during the summer, or in about six months, and attain a height in one summer of from 40 ft. to 80 ft., according to soil and situation. The groves consist of several hundred bamboos, planted about 12 ft. apart, kept free from weeds and undergrowth of every kind. The bamboos produce dense shade; a bamboo grove is one of the coolest retreats in summer; the shade and shelter produced contribute in a great measure to their luxuriance. This bamboo rarely seeds, and the few seeds produced are said to be most difficult to germinate; the propagation is by the removal of one-year-old matured stems with roots; the young offset taken in spring invariably withers and dies. The young offsets removed to strengthen the growth of those required for commerce when matured are edible; sliced and boiled they are tender and crisp and of a very delicate flavor, and are served at table as an ordinary vegetable; the offsets at the same tender age (when about 6 in. or 12 in. through the ground) are also sliced and preserved with ginger, and form the commercial preserve 'chow-chow.' When the bamboos are matured, they are cut near to the ground, and used for scaffold poles, fences, guttering for houses, down pipes, underground drains, garden seats, ladders, and a thousand other purposes. This bamboo will grow on Australian mountain sides, and in any valleys where ordinary shelter and rich, deep soil can be procured, and will stand 14° of frost." This plant appears to be well adapted for cultivation in the United States.

Great Find of Egyptian Relics.

A discovery of great importance to Egyptologists, and of no little popular interest, is reported by a Cairo correspondent of the London *Times*. The finds include not only the largest and most beautiful papyri yet discovered, but also the mummies of no less than thirty royal personages, among them Kings Thothmes III. and Ramses II. These names have lately been made familiar to our readers in connection with the obelisk lately transferred from Alexandria to Central Park. It was the former who ordered the construction of the obelisk, and the latter who, 270 years later, caused to be inscribed on its faces his own official titles and honors. These two monarchs have been removed to the Boulak Museum, where they lie side by side, and even the flowers and garlands which were placed in their coffins may to-day be seen encircling the masks which cover the faces of the deceased just as they were left by the mourners over three thousand years ago.

The story of the discovery runs as follows: Last June, Daoud Pasha, Governor of the Province of Keneh, which includes the ancient Theban district, noticed that the Bedaween offered for sale an unusual quantity of antiquities at absurdly low prices. The Pasha soon discovered that the source of their hidden treasure was situated in a gorge of the mountain range which separates Deir-el-Bahari from the Bab-el-Melouk. This gorge is situated about four miles from the Nile to the east of Thebes. Daoud Pasha at once telegraphed to the Khedive, who forthwith dispatched to the spot Herr Emil Brugsch, a younger brother of Dr. Henry Brugsch Pasha, who, during M. Maspero's absence in Paris, is in charge of all archæological excavations in Egypt. Herr Brugsch discovered in the cliffs of the Libyan Mountains, near the Temple of Deir-el-Bahari, or the "Northern Convent," a pit about 35 feet deep, cut in the solid rock; a secret opening from this pit led to a gallery nearly 200 feet long, also hewn out of the solid rock. This gallery was filled with relics of the Theban dynasties. Every indication leads to the conviction that these sacred relics had been removed from their appropriate places in the various tombs and temples, and concealed in this subterranean gallery by the Egyptian priests to preserve them from being destroyed by some foreign invader. In all probability they were thus concealed at the time of the invasion of Egypt by Cambyses.

Herr Brugsch at once telegraphed for a steamer, which on Friday last safely deposited her precious cargo at the Boulak Museum. The full value of this discovery, of course, cannot as yet be determined. The papyri have not yet been unrolled, nor have the mummies been unwrapped. Conspicuous by its massive gold ornamentation, in which cartouches are set in precious stones, is the coffin containing the mummy of Maut Nedjem, a daughter of King Ramses II. Each of the mummies is accompanied by an alabaster canopic urn, containing the heart and entrails of the deceased.

Four papyri were found in the gallery at Deir-el-Bahari, each in a perfect state of preservation. The largest of these papyri—that found in the coffin of Queen Ra-ma-ka—is most beautifully illustrated with colored illuminations. It is about 16 inches wide, and when unrolled will probably measure from 100 to 140 feet in length. The other papyri are somewhat narrower, but are more closely written upon. These papyri will probably prove to be the most valuable portion of the discovery, for in the present state of Egyptology a papyrus may be of more importance than an entire temple, and, as the late Mariette Pasha used to say: "It is certain that if ever one of those discoveries that bring about a revolution in science should be made in Egyptology, the world will be indebted for it to a papyrus."

No less than 3,700 mortuary statues have been found which bear royal cartouches and inscriptions. Nearly 2,000 other objects have been discovered. One of the most remarkable relics is an enormous leather tent, which bears the cartouche of King Pinotem, of the 21st dynasty. This tent is in a truly wonderful state of preservation. The workmanship is beautiful. It is covered with hieroglyphs most carefully embroidered in red, green, and yellow leather. The colors are quite fresh and bright. In each of the corners is represented the royal vulture and stars.

The following Theban sovereigns are the most important of those whose mummies Herr Brugsch has identified:

Aahmes I. (Amosis), first King of 18th Dynasty, reigned B. C. 1700 (about).

Amenhotep I. (Amenophis), second King of 18th Dynasty, reigned B. C. 1666 (about).

Thothmes I., third King of 18th Dynasty, reigned B. C. 1633 (about.)

Thothmes II., fourth King of 18th Dynasty, reigned B.C. 1600 (about).

Thothmes III. (the Great), fifth King of 18th Dynasty, reigned B. C. 1600 (about).

Ramses I., first King of 19th Dynasty, reigned B. C. 1400 (about).

Seti I., second King of the 19th Dynasty, reigned B. C. 1366 (about).

Ramses II. (the Great), third King of the 19th Dynasty, reigned B. C. 1333 (about).

Pinotem, third King of the 21st Dynasty, reigned B. C. 1033 (about).

Raskhenen (Dynasty and date of reign unknown).

Queen Ra-ma-ka (Hatasou?)

Queen Aahmes Nofert Ari.

A correspondent of the London *Post* adds the following details about the recent discoveries in Egypt: "The place where these precious relics were found is an almost inaccessible cave in the face of the perpendicular mountain, in another part of which the royal cemetery, known as Bab-el-Melouk, is excavated, and not far from Deir-el-Bahari. The most remarkable of the 4,000 objects are 36 royal sarcophagi, with their inner cases and mummies intact, belonging to Pharaohs, queens, princess princesses, and high priests of the seventeenth, eighteenth, nineteenth, and twenty-first dynasties, so that we are actually in possession of the lifeless bodies of many heroes, who, upward of three thousand years ago, ruled over this country and adorned it with temples and obelisks which are the wonder and admiration of the whole civilized world. Among them is that of Seti I., whose tomb in the Bab-el-Melouk was discovered by Belzoni, but that explorer found neither coffin nor mummy, only the large alabaster sarcophagus now in the Soane Museum, which was made to contain and preserve them. Next in importance we have the plain but highly polished wooden coffin of Ramses II., the Sesostris of the Greeks, with the mummy intact, the royal cartouche distinctly legible on the coffin lid and on the mummy cloths enveloping the body. The mummy cases of Amosis, son of Amousa, of Thothmes I., II., and III., of Queen Ra-ma-ka and her daughter Mout-em-hat, of King Raskhenen, of Aahmes Nofert Ari, of Aah Hotep, of Ramses I., and of Amenophis, are also in the collection, with the mummies in perfect preservation. The majority of these mummies are inclosed in two coffins, both elaborately ornamented with paintings and gildings, some of them having also certain ornaments inlaid with colored glass, and many of the faces have glass eyes, which give them a most lifelike appearance. Another remarkable object is a royal tent made of colored leather in a checkered pattern of red and green. The inner side of the dome is of blue leather, with yellow stars, and the hieroglyphic inscriptions are perforated in the colored leather with a backing of yellow. Fifteen royal wigs for state occasions are also in the collection. Besides the human mummies we find one of a gazelle, which was probably a favorite playmate of one of the Egyptian princes or princesses. We have also four scrolls of papyrus of great size, on which is inscribed the Ritual of the Dead, elaborately illuminated, and containing the cartouches of the royal persons for whom they were written, one of whom is Queen Hatasou, sister of Thothmes III. Moreover, we have several sets of canopic vases in alabaster, with royal names engraved on the outer surface, 3,700 funereal statuettes, and many other objects of interest. The position of the cave is an almost inaccessible part of the mountain, the well, 36 feet deep, communicating, by a gallery of 250 feet in length, with a rough-hewn chamber, and the confused state in which all these objects of veneration were found, heaped one on another and strewn about on the ground, lead Mr. Brugsch to the very plausible inference that they had been by friendly hands collected from the various tombs and concealed in this place of safety at the time of some threatened foreign invasion."

Vaccination and Smallpox.

During the six months ending June 30, the Deptford Smallpox Hospital, which receives patients from all parts of London, received 546 cases of smallpox, of which 326 had been vaccinated, and 264 had not been, while of 46 it was unknown whether they had been vaccinated or not. Among the vaccinated cases the deaths numbered only 6, or 2·5 per cent; among the unvaccinated they reached a total of 127, which was 48 per cent. Of the 46 doubtful cases 9 were fatal.

Canal Work at Panama.

The engineers and laborers on the Panama Canal are said to be suffering severely from yellow fever and the malarial fevers peculiar to the Isthmus. Many deaths are reported. In a recent issue the Panama *Star and Herald* criticises somewhat unfavorably the manner in which the work is conducted and the seeming discrepancies between the reports given in the Canal Bulletin and the actual work going on. On the latter point the *Star and Herald* says:

"So far as machinery is concerned, material, etc., we are aware that important arrivals are announced by every steamer. Launches, excavators, railroad iron, carts, tools of every description, and large amounts of lumber are now on hand at Aspinwall, but they do not move out on the line quite as fast as people there thought was likely. American opinion of the machinery is unfavorable. The tools are of old styles, rolling stock of the most antiquated pattern, heavy, and unsightly, and not adapted to the class of labor obtainable on the Isthmus. A couple of hand-cars sent out are a curiosity, with their iron frames, iron seats, and old style of movement. It is hardly likely they will be used. The excavators are ponderous affairs, and will probably do work in loose soil or sand, but in that which confrots them on the Isthmus will hardly work effectively without some trouble.

"For removing bowlders and loose rock of any sort we are told they do not come up to inventions employed in the United States. In fact, we understood that the machinery, tools, etc., to be employed were to have been manufactured in the United States, and, notwithstanding the heavy orders now under way in Europe, we fancy a return to that idea would not be disadvantageous to the service. It is well known that in the matter of axes, picks, shovels, etc., and in more important and heavier machinery, for work of this class America beats the world. Give a workman good tools if you wish him to serve you well.

"However, there is work in progress, and important work also, and for that, as friends of the enterprise, let us be thankful. In addition to the work going forward at Culebra, Empire, and other places, at Gatun considerable movement is noticeable. A gentleman connected with the enterprise informs us that they now have there about 250 men, who are leveling in front of the station for a machine shop, etc. The hill back of the station-house will be reduced about 35 feet, and leveled over an area of between one-quarter and one-half mile square. This they will do with pick, shovel, and wheelbarrow. When it is leveled they will put 200 houses on it for their employés."

The Phosphates of South Carolina.

In a paper on the resources of South Carolina, read before the convention of bankers at Saratoga, Dr. Andrew Simonds gave some interesting statistics of the phosphate trade and its influence upon the general prosperity of the State. The first shipments of crude rock were made in 1867, six tons to domestic ports, which has increased year after year, the shipments to both foreign and domestic ports reaching in 1881 near 300,000 tons crude rock, marketed by both the land and water companies. An idea of the value of the deposits may be formed from the fact that the shares of one company of the par value of $100 have sold at $1,000 each. The distribution of these fertilizers through the South Atlantic cotton belt is telling wonderfully on the increased production of cotton on the old and worn lands of these States. While the production of cotton has nearly doubled in the last decade, the increase far outstripping the increase of population; the greatest specific increase being in the Atlantic cotton States, which have first felt the influence of the phosphates where the product per acre has almost reached that of Mississippi and Texas. In 1880 there were in South Carolina alone about 1,800 looms and about 93,000 spindles, as against 700 looms and 33,000 spindles in 1870, and it is only now, in 1881, that the people are really turning their attention to this branch of industry, realizing at last what has been repeatedly urged by sagacious writers, that the looms should be brought to the cotton, rather than the cotton should be carried to the looms. Southern spinners have some decided advantages over their Northern competitors. They get the raw material from or very near the producer, and therefore at lower cost; the cotton is cleaner, and there is less waste; the operatives live more cheaply, and are satisfied with less wages; the hours of labor are longer; and lastly, a part of the products can be sold directly from the mill, and therefore at a saving in the cost of transportation. But the most gratifying feature is that the great bulk of the capital invested has been furnished by Southern people."

The Heart of Asia.

At a recent meeting of the Russian Geographical Society, M. Severtzov gave an account of the Pamir Mountains, which he had lately visited. Many of the facts are novel. The Pamir is not a table land, and it has no steppe region up to a height of 12,000 feet. Like the Tien-Shan and Thibet, the Pamir has narrow valleys along the rivers up to a height of 14,000 feet, and the mountains rise in lofty ridges above the valleys in some instances to an absolute height of 25,000 feet. The mountain ranges run in the direction of the meridian, and seldom strike out at right angles. The explorer discovered evidence that the range of the Inner Pamir has risen 600 feet in the course of the last 12,000 years, and that the process of elevation is still going on.

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MISCELLANEOUS INVENTIONS.

An improved reed organ action has been patented by Mr. John L. Hinners, of Pekin, Ill. By means of the crimped flexible diaphragm, a passage is provided for adjustable wire connections between valves and keys; these wires, being a substitute for the wooden pushpins commonly used in reed organs, are proof against extremes of temperatures and possibility of destruction by mice or vermin; besides being free from the many objections to pushpins, it embodies a number of advantages not attainable in reed organs as ordinarily constructed.

Mr. Robert Koenitzer, of St. Louis, Mo., has patented a process of tanning hides by first treating them with a bath or solution of copperas, bichromate of potassium, and alum, then adding a solution of salt and salt of tin to the bath, then adding a solution of copperas, bichromate of potassium, alum, and saltpeter to the same bath, then removing and drying the hides, and finally treating them with a solution composed of sugar of lead, vinegar, water, and glycerine.

In plumbing arrangements of dwellings an air or ventilating pipe is usually provided, such pipe opening to the outer air and having connection with the upper portion of the waste traps, so as to prevent them from being emptied by suction in the waste pipe, and also to allow escape of gases. Such ventilating pipes are necessarily an extra expense, both in material and labor of putting them in place. Mr. Thomas C. Townsend, of New York city, has patented an improved waste pipe and fittings, which is less expensive and more readily applied than the separate pipe generally used.

An improved caster has been patented by Mr. John Toler, of Newark, N. J. This invention is an improvement on the furniture caster for which Letters Patent No. 224,249 were issued to the same inventor February 3, 1880.

An improved windmill has been patented by Mr. David Althouse, of Farragut, Iowa. The object of this invention is to cheapen the construction, increase the durability, and facilitate the controlling of windmills.

An improved wagon seat corner iron has been patented by Mr. Alexander Hallenbeck, of Cobleskill, N. Y. The invention consists of an angle iron plate having an inclined end piece to fit on the bottom of the wagon seat, and having a rib or web extending along its back, on each side of which, at its edge, is a flange set thereon at an angle of about forty-five degrees, the two flanges forming a V-shaped anchoring piece that is designed to be entered into corresponding grooves in the back and ends of the seat, where they are jointed together.

Mr. Patrick Newell, of Bradford, Pa., has patented an improved test for sampling the contents of oil tanks. It consists of a long tubular instrument, so constructed that on being lowered into the oil tank its interior can be opened to admit of the simultaneous inward flow of specimens of the tank contents at different layers or elevations. After this inflow of the sample, by simply shutting the instrument the samples are inclosed and held within the instrument in the same relative position in respect to each other as when first admitted. The instrument is then removed from the tank, and the samples may then be examined while still within the instrument, or may be removed therefrom for examination as desired.

An improved bracelet gauge has been patented by Mr. Willis H. Howes, of New York city. The object of this invention is to facilitate the manufacture of bracelets of a given form and size, and also to facilitate the selection of bracelets of a given form and size from a stock. It consists of a bracelet gauge with four quarter sections of an oval, connected by four bars, secured in pairs at right angles with each other to two diagonal sections, the said bars passing through keepers attached to the other section and being locked in place by a set screw, whereby the gauge can be adjusted to fit a bracelet of any desired size and form.

An improved vise has been patented by Mr. Anson M. Howard, of Enfield, Mass. The object of this invention is to obtain parallel movement of the moving jaw in vises by simple and durable mechanism, which can be readily applied to vises of ordinary construction. The invention consists in a rack and pinion attachment fitted for operation by the vise screw.

Artesian Well at Streator, Ill.

The work of boring the artesian well, which was begun at Streator, Ill., by the city authorities about the middle of last October, is completed. The well is now down 2,496 feet—just four feet less than the contractor had agreed to go. The Potsdam sandstone in which the water was found was struck at a depth of 2,163 feet. The first fifteen feet was of a dark drab color, followed by 35 feet of reddish buff sandstone. Then came the pure white sand, into which the drill went 283 feet, where it stopped at a depth of 2,496 feet, and through a vein of Potsdam sandstone 333 feet thick. A vein of water was found in the St. Peter's sandstone, at about 285 feet below the surface, which rose to within 40 feet of the top; but, as the drill went on down, it passed through some porous limestone, which absorbed a portion of the water and let it down to 80 feet below the surface, where it remained for some time. When the drill was down to 2,248 feet, being 35 feet into the white vein of Potsdam, the water began to rise, and continued so to do. When the drill was at 2,278 feet the water began to flow over the top. At 2,297 feet it flowed 85 gallons per minute, and at 2,448 feet it flowed 100 gallons. This flow has been increased to 107 1-16 gallons, at which time the boring stops. Tests show that the well has a head of 45 feet 2½ inches above the surface of the ground, being higher than the cornice line of any building in the city. The water is very salty, and also contains some magnesia and iron. Several other minerals are present, but in very small quantities. The taste of the water is at first unpleasant on account of the salt; but, after one becomes more accustomed to drinking it, it is more palatable. Many persons pronounce it very similar to the Congress springs at Saratoga. The temperature is 74 degrees when it flows from the well. Many of the citizens are keeping it regularly in their houses, and seem to think that it possesses rare medicinal qualities. The piping of the city will begin immediately, and it is hoped that Streator will now have an abundance of pure, fresh water, free from the sulphur which predominates in many of our surface wells.—*Chicago Tribune.*

Four-Foot Turbines with an Eighty-Foot Head.—Water Power at Niagara.

In a paper on "The Water Power of Niagara," read before the recent Bankers' Convention at Saratoga, Mr. Delano described a remarkable development of power at Niagara Falls, soon to be completed. There will be three turbines, four feet in diameter, with eighty feet of head fed by a tube seven feet in diameter, each turbine giving 1,000 horse power, with the whole power of the great lakes and the Niagara River to re-enforce them. The experiment of using so great a head in turbines of such unusual dimensions will be watched by mechanical engineers with much interest. Some of the rivers which have been dammed for the benefit of mankind, and the force which they furnish reduced to the standard of horse power, are as follows: The Passaic, at Paterson, N. J., 1,000 horse power; the Merrimac, at Lowell, 10,000; the Mohawk, at Cohoes, 14,000; the Connecticut, at Hadley, 17,000; the Androscoggin, at Lewiston, 11,000; the Housatonic, at Canaan Falls, 3,000; the Mississippi, at the Falls of St. Anthony, 15,000; the Oswego, at Oswego, 4,000. The sum total of these is 75,000 horse power. But this is used over again on an average not less than three times. This would show a larger total of 225,000 horse power. There are also very many smaller streams in all the hill sections of the country which are utilized, and may furnish an aggregate, used and unused, equal to the last named total of 225,000, thus giving a grand total of nearly 500,000 horse power, distributed over a wide extent of country, and supplying in the way the wants of 50,000,000 of people. But these are only minor powers, so to speak, of the hills and valleys. The grand dominating power that could absorb them all and still have room to give hospitable refuge to four times as many remains to be noticed. It is the Niagara River. From data furnished by the United States Lake Survey Bureau in 1875, it appears that the average flow of the river above the falls is 10,000,000 cubic feet per minute. Converting this into horse power under a head of 200 feet, we have a grand aggregate of 3,000,000 horse power—a mighty force that would supply the economic wants of 200,000,000 people.

Underground Life in England.

The discussions about the Channel Tunnel, and as to the probability of its being generally used by passengers when made, have prompted inquiry into the extent of underground roadways already existing in Great Britain, and the number of persons in the country who are habitually employed at a much greater depth beneath the surface than that to which travelers under the Straits of Dover would have to descend. The number of persons employed underground in all the mines in Great Britain is 378,151. The length of underground tunneling in which they work is not less than 58,744 miles. This is the estimate of Messrs. Higson, the mining engineers. As regards depth, the Channel is nowhere deeper than 180 feet, and the lowest part of the tunnel would not be below 200 feet from the surface, or 66⅔ yards. The greatest depth of the underground tunnels connected with our coal and other mines is about 2,800 feet, and probably the smallest depth 300 feet. From an engineering point of view, then, the question of the Channel Tunnel seems to be one of adding, roughly speaking, only one-thirtieth of one per cent to the existing underground passages.

Car Cable in Chicago.

The work of introducing the cable system of street railways in Chicago has been in progress now for several months, but according to the local papers it is still far from being completed. Almost the whole of State street is now in a condition that makes the passage of teams almost impossible. Tracks are removed and dirt lies in high piles in the center of the thoroughfare. Hundreds of thousands of dollars have already been spent and several more will be before the work is finished. Meanwhile the citizens bear the temporary inconvenience with considerable patience in view of the great permanent convenience which is expected to follow the introduction of a system which is said to have proved very popular in San Francisco, where it is in use on some of the streets.

Another Quarter-Second Reduction.

At Rochester, N. Y., the famous trotter, Maud S., lowered the best record for one mile by a quarter of a second. The time was 2:10¼, or a full second less than the best record of any other horse. The successive quarters were covered in 32¾ seconds, 32½ seconds, 32¼ seconds, and 32¾ seconds respectively.

Naphthol, a New Remedy for Cutaneous Diseases.

Prof. Kaposi, of Vienna, opines that in naphthol he has discovered an agreeable substitute for tar for skin diseases. Tar, with all its good properties, is so disagreeable to use that in many cases its employment is prohibited. Reasoning that among the many constituents of tar there must be one which should represent in part the remedial properties, he set out to experiment, and chose, for a beginning, naphthol. His first results were so flattering that he has made preliminary mention of his supposed discovery at a meeting of the Medical Society of Vienna, reserving details of treatment, however, for future investigation. The article employed, known as α-naphthol, is found in commerce in large lumps with crystalline structure, being somewhat crumbling, of a violet-brownish color, with an odor faintly reminding one of carbolic acid; it is readily soluble in alcohol, oils and fats, and in a lesser degree in dilute alcohol. Kaposi has employed a ten per cent. alcohol solution and a fifteen per cent. ointment of naphthol. It imparts to the integument only a light-brown coloration, and produces moderate desquamation. Applied in excess it will produce a little swelling and desquamation, but never any exudations. The medicament is rapidly absorbed into the organism, but as rapidly eliminated. After the lapse of twenty-four hours it cannot be detected in the urine. The ointment does not stain linen, while the solution colors it a beautiful pink, but these stains are easily removed by means of hot water and soap.—*Wien. Med. Ztg.*

Long Swims by Men and Animals.

Referring to the wonderful feats of swimming performed by Webb, the opinion is expressed in *Nature* that men and animals would sustain themselves for long distances in water much oftener were they not incapacitated by terror or completely ignorant of their real powers.

Some years since the second mate of a ship fell overboard while fisting a sail. It was blowing fresh, the time was night, and the place some miles out in the stormy German Ocean. The hardy fellow nevertheless managed to gain the English coast. Brock, with a dozen other pilots, was plying for fares by Yarmouth, and as the mainsheet was belayed, a sudden puff of wind upset the boat, when presently all perished except Brock himself, who from 4 in the afternoon of an October evening to 1 the next morning swam thirteen miles before he was able to hail a vessel at anchor in the offing. Animals themselves are capable of swimming immense distances, although unable to rest by the way. A dog recently swam thirty miles in America in order to rejoin his master. A mule and a dog washed overboard during a gale in the Bay of Biscay have been known to make their way to shore. A dog swam ashore with a letter in his mouth at the Cape of Good Hope. The crew of the ship to which the dog belonged all perished, which they need not have done had they only ventured to tread water as the dog did. As a certain ship was laboring heavily in the trough of the sea it was found needful, in order to lighten the vessel, to throw some troop horses overboard which had been taken in at Corunna. The poor things, a staff surgeon said, when they found themselves abandoned, faced round and swam for miles after the vessel. A man on the east coast of Lincolnshire saved quite a number of lives by swimming out on horseback to vessels in distress. He commonly rode an old gray mare, but when the mare was not to hand he took the first horse that offered.

Girls as Wood Engravers.

A contemporary asked a wood engraver why he did not employ girls. His reply was:

"I have employed women very often, and I wish I could feel more encouraged. But the truth is that, when a young man comes to me and begins his work, he feels that it is life's business. He is to cut his fortune out of the little blocks before him. Wife, family, home, happiness, and all are to be carved out by his own hand, and he settles steadily and earnestly to his labor, determined to master it, and with every incitement spurring him on. He cannot marry until he knows his trade. It is exactly the other way with the girl. She may be as poor as the boy, and as wholly dependent upon herself for a living, but she feels that she will probably marry by and by, and then she must give up wood engraving. So she goes on listlessly; she has no ambition to excel; she does not feel that all her happiness depends on it. She will marry, and then her husband's wages will support her. She may not say so; but she thinks so, and it spoils her work."

Another Balloon Experiment.

Professor Samuel A. King is constructing at Philadelphia a large balloon of rubber cloth in which he proposes to make a long voyage across the continent, early in September, to test his theory that there is a regular eastward drift of the atmosphere at some undetermined distance above the earth. His plan is to build a large balloon capable of holding hydrogen and of maintaining itself during a long flight; and if his theory holds good, say for the distance between the Mississippi River and the Atlantic coast, he thinks he can reasonably trust it for subsequent aerial flight across the sea. He names Minneapolis, Minn., as the probable point of ascension, and September 7 as the date.

UTILIZATION OF OLD RUBBER.—The pieces are heated in contact with steam, when the sulphur is volatilized and the caoutchouc melts, and is collected as a liquid, used in preparing waterproof covers, etc.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Alden Crushers. Westinghouse Mach. Co., Pittsb'g, Pa.

Engines, 10 to 50 H. P., $250 to $500. See adv., p. 158.

Wanted—A good Patent. B, Box 2635, Boston, Mass.

Turkey Emery, Star Glue, Pumice, Walrus Leather, Polishers' Supplies. Green, Tweed & Co ,118 Chambers St., N.Y.

Second-hand Machinery for sale. List free. E. Side, 370 South First St., Brooklyn, E. D., N. Y.

If every farmer in the country would examine Boomer & Boschert's Cider Press, they would at once see the advantage of using one to utilize the immense crop of apples so abundant. The price is exceedingly reasonable. New York Office, 15 Park Row.

No. 196,666. Processes for Manufacturing Paper Pulp. Douglas Hickox, Springfield, Ill. Patented October 30, 1877. Has been in constant use since 1876. The most perfect process in use on any kind of stock. Will sell a few States. Would like correspondence with manufacturers of pulping machinery. Address as above.

"How to Keep Boilers Clean," and other information for steam users. Book of sixty-four pages, published by Jas. F. Hotchkiss, 84 John St., New York, mailed free to any address.

For Sale.—Screw Cutting Engine Lathe, New Haven make, 27 inch swing; will take 18½ feet between centers; second-hand, with three tool rests. Williams, White & Co., Moline, Ill.

Rolled Nickel Anodes, Grain Nickel, Nickel Salts, Platers' Supplies. Greene, Tweed & Co., New York.

Supplee Steam Engine. See adv. p. 140.

Abbe Bolt Forging Machines and Palmer Power Hammer a specialty. S. C. Forsaith & Co., Manchester, N. H.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

See Bentel, Margedant & Co.'s adv., page 157.

List 26.—Description of 2,500 new and second-hand Machines, now ready for distribution. Send stamp for the same. S. C. Forsaith & Co., Manchester, N. H.

Combination Roll and Rubber Co., 27 Barclay St., N. Y. Wringer Rolls and Moulded Goods Specialties.

Silica Paints (not mixed); all shades. 40 Bleecker St., N.Y.

Punching Presses & Shears for Metal-workers, Power Drill Presses. $25 upward. Power & Foot Lathes. Low Prices. Peerless Punch & Shear Co., 115 S. Liberty St., N.Y.

Improved Skinner Portable Engines. Erie, Pa.

The Eureka Mower cuts a six foot swath easier than a side cut mower cuts four feet, and leaves the cut grass standing light and loose, curing in half the time. Send for circular. Eureka Mower Company, Towanda, Pa.

Turbine Wheels; Mill Mach'y. O.J. Bollinger, York, Pa.

Pure Oak Leather Belting. C. W. Arny & Son, Manufacturers, Philadelphia. Correspondence solicited.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Wood-Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O.

Experts in Patent Causes and Mechanical Counsel. Park Benjamin & Bro., 50 Astor House, New York.

Cope & Maxwell M'f'g Co.'s Pump adv., page 125.

Malleable and Gray Iron Castings, all descriptions, by Erie Malleable Iron Company, limited, Erie, Pa.

National Steel Tube Cleaner for boiler tubes. Adjustable, durable. Chalmers-Spence Co., 10 Cortlandt St., N.Y.

Corrugated Wrought Iron for Tires on Traction Engines, etc. Sole mfrs., H. Lloyd, Son & Co., Pittsb'g, Pa.

Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr., & Bros., 531 Jefferson St., Philadelphia, Pa.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, importers Vienna lime, crocus, etc. Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Presses, Dies, Tools for working Sheet Metals, etc. Fruit and other Can Tools. E. W. Bliss, Brooklyn, N. Y.

4 to 40 H. P. Steam Engines. See adv. p. 126.

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For best Duplex Injector, see Jenks' adv., p. 142.

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C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 141.

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Ore Breaker, Crusher, and Pulverizer. Smaller sizes run by horse power. See p. 158. Totten & Co., Pittsburg.

The None-such Turbine. See adv., p. 141.

Machine Diamonds. J. Dickinson, 64 Nassau St., N. Y.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

50,000 Sawyers wanted. Your full address for Emerson's Hand Book of Saws (free). Over 100 illustrations and pages of valuable information. How to straighten saws, etc. Emerson, Smith & Co., Beaver Falls, Pa.

Telegraph, Telephone, Elec. Light Supplies. See p. 156.

For Pat. Safety Elevators, Hoisting Engines. Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 158.

Elevators, Freight and Passenger, Shafting, Pulleys and Hangers. L. S. Graves & Son, Rochester, N. Y.

Gear Wheels for Models (list free); Experimental Work, etc. D. Gilbert & Son, 212 Chester St., Phila., Pa.

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Comb'd Punch & Shears; Universal Lathe Chucks. Lambertville Iron Work. Lambertsville, N.J. See ad, p. 157.

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Cutters for Teeth of Gear Wheels formed entirely by machinery. The Pratt & Whitney Co. Hartford, Conn.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p.156.

Rollstone Mac. Co.'s Wood Working Mach'y ad. p. 157.

For best low price Planer and Matcher, and latest improved Sash, Door, and Blind Machinery, Send for catalogue to Rowley & Hermance, Williamsport, Pa.

The only economical and practical Gas Engine in the market is the new "Otto" Silent, built by Schleicher, Schumm & Co., Philadelphia, Pa. Send for circular.

The Common Sense Dry Kiln prevents check, warp, or hardened surface. See St. Albans M'f'g Co.'s adv. p.158.

The Porter-Allen High Speed Steam Engine. Southwork Foundry & Mach. Co., 430 Washington Av., Phil. Pa.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) N. P. H. asks: Is there a fireproof paint manufactured? If so, of what is it composed, and who makes it? If not, can it be made for outside work, and of what? A. We know of no paint that is absolutely fireproof. Water glass in connection with mineral matters and metallic oxides forms paints that are non-inflammable. See Water-glass, page 16, current volume.

(2) S. C. asks how many purposes olive oil is used for. A. Olive oil is chiefly used as a condiment, as a lubricant for light machinery, and in the manufacture of soap.

(3) M. J. M. asks: Would it be injurious to the health of the occupant of a sleeping room to burn a coal oil stove in the apartment two or three hours daily? A. Yes, if the room is not well ventilated.

(4) R. M. asks how to stain poplar wood in imitation of Spanish cedar for cigar box lumber. A. Kiln-dry the wood and stain it by immersion in nitric acid or in strong nitrate or sulphate of iron solution. Then oil slightly.

(5) M. E. K. asks: What kind of cement is used, and what the process of putting the rubber coating on to the rollers of clothes wringers? A. Use marine glue. See receipt No. 8, under Cements, page 1025, SUPPLEMENT, No. 158.

(6) W. & S. ask: What is the fastest run on record of a locomotive? A. Locomotives have run on straight track at the rate of 70 to 75 miles per hour.

(7) W. G. B. asks: Is galvanized iron pipe fit to be used as a suction pipe for wells or cisterns intended for family uses? Is it poisonous? Which is the most durable, and which would be the best: galvanized or tarred pipe? A. Galvanized iron pipe should not be used for water for domestic purposes. It is likely to poison the water. We should prefer the tarred pipe.

(8) E. H. asks: Why do some chemistries give AmS as a group test and others AmHS? A. The former is according to the older system of nomenclature. Ammonic sulphide should be expressed $H(NH_4)S$. 2. How much H_2S will water absorb under ordinary pressure? A. From three to six times its volume, according to temperature. 3. About what per cent of the gas is absorbed while passing through half a foot of water? A. It depends upon the size of the bubbles, the quantity of gas passed in a given time, the temperature and degree of saturation of the liquid, and the pressure. 4. Does not H_2S affect rubber? A. Slightly.

(9) G. W. D. asks for the composition of what is called phosphor brass, and how it is mixed and melted together. A. In preparing phosphor brass, about one-tenth of one per cent of dry phosphorus is introduced into the melted metal (good red brass) in a covered crucible.

(10) G. C. D. asks: How shall I construct a wood building capable of keeping lime from air slaking in hot weather? A. Make the structure as nearly airtight as possible. Good common building paper, well lapped, can be used with advantage for lining wooden sheds. Lime may be kept for an indefinite time unchanged in dry air. Moisture in the air is what occasions the slaking.

(11) C. O. A. asks how to separate the silver from a solution of cyanuret of potassium and nitrate of silver. A. Add to the warm solution hydrochloric acid until a precipitate ceases to form, separate the precipitate by filtration, dry it, mix the dry powder with an equal weight of borax glass (anhydrous borax) and heat all gradually to bright redness in a small covered black lead crucible. Cool, break the crucible, and remove the button of silver which will be found at the bottom if the fusion has been properly carried out. The decomposition of the double cyanide by acid should be accomplished out of doors and with care to avoid inhaling the very poisonous gases given off.

(12) W. G. M. asks: Could a spring weighing apparatus be constructed to accurately show the weight of substances varying from 50 lb. to 2 tons, and how would such an apparatus be affected by the temperature? Could an instrument capable of accomplishing the above be made by use of water pressure, or a gas in a tight cylinder? A. Springs, air or gas, would be affected by change of temperature. It could probably be effected by a column of water, though change of temperature would affect it slightly.

(13) S. S. asks: How can I best extract the over saltness and sweeten the flavor of hams and bacon preparatory to smoking them? [Perhaps some of our readers can furnish our correspondent with this information.]

(14) W. W. asks how to clean a white Manila hat. A. Sprinkle with water and expose it to the fumes of burning sulphur in a tight box.

(15) G. E. D. asks: 1. What is used to stain violins? A. See page 74, answer No. 6, vol. xliv. 2. What is used to prevent toilet or shaving soap from shrinking—is it pressed? If so, where can I get a press, and what do they cost? A. The natural shrinking is allowed to take place before pressing. See column of Business and Personal and Hints to Correspondents. 3. Which makes the strongest floor, two one-inch board or two inch plank, where the sleepers are two or two and a half feet apart? A. The boards, if tongued and grooved; otherwise there is little difference, if they are of the same stuff and equally well seasoned.

(16) R. N. asks: How is cotton seed oil made? A. See "The Manufacture of Cotton Seed Oil," page 25, current volume.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

August 9, 1881,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

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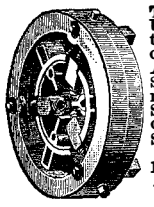

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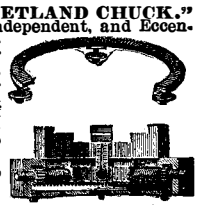

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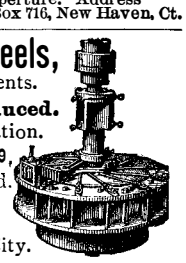

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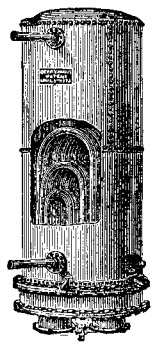

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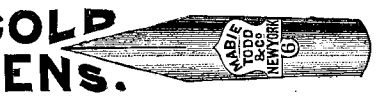

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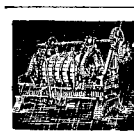

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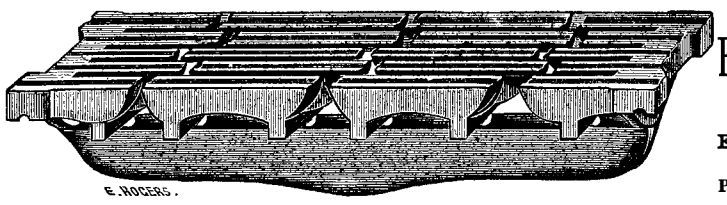

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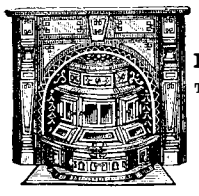

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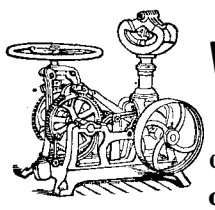

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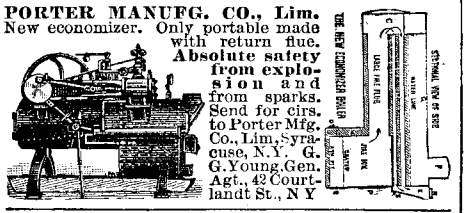

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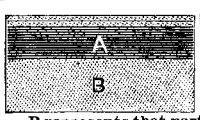

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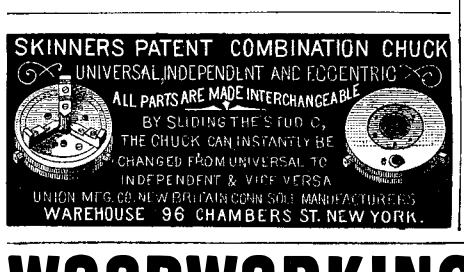
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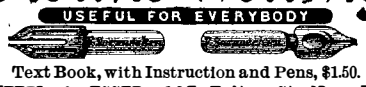

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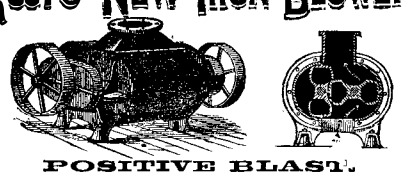

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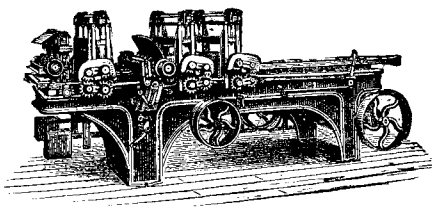

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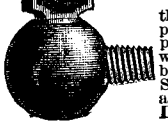

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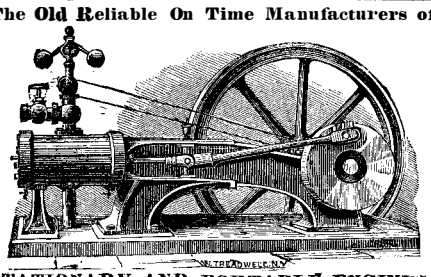

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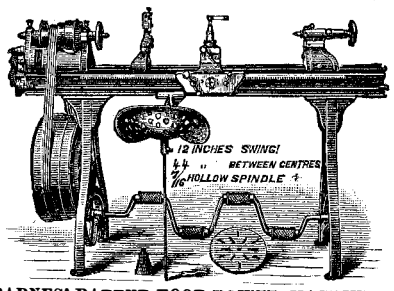

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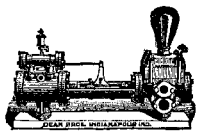

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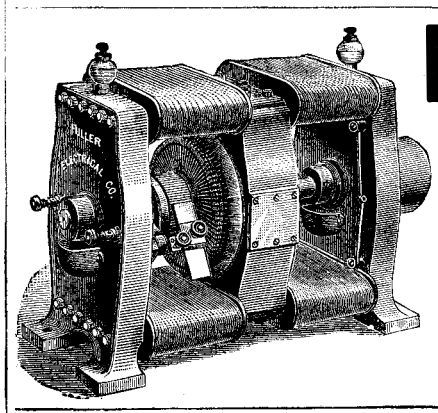

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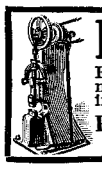

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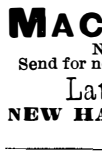

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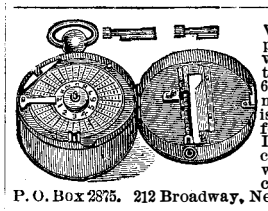

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